EPA/ROD/R05-95/280
1995

EPA Superfund
Record of Decision:

MUSKEGO SANITARY LANDFILL
EPA ID: WID000713180
OU 02
MUSKEGO, WI
02/02/1995

DECLARATION

RECORD OF DECISION
SELECTED REMEDIAL ALTERNATIVE FOR
GROUNDWATER FINAL REMEDY
FOR MUSKEGO SANITARY LANDFILL

Site Name and Location:

Muskego Sanitary Landfill
Muskego, Wisconsin

Statement of Basis and Purpose:

This decision document presents the selected remedial action for the Muskego Sanitary Landfill located in Muskego, Wisconsin. The decision has been developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to the extent practicable. The attached index identifies the items that comprise the Administrative Record, upon which the selection of the remedial action is based.

Assessment of the Site:

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare or the environment.

Description of the Selected Remedy:

The Final Remedy addresses protection of ground water and potential exposure to ground water through engineering controls. Institutional controls have already been initiated through the interim source control action. The principal threats are direct exposure to contaminated groundwater through ingestion or inhalation at private wells. This remedy is described as follows:

- Monitor groundwater throughout the site,
- Conduct a groundwater pumping test(s),
- Install and operate groundwater extraction in the vicinity of the Non-Contiguous Fill Area,
- Perform on-site treatment and discharge of extracted groundwater from the Non-Contiguous Fill Area,
- Discharge treated water to an on-site infiltration basin in accordance with state standards, and
- Dispose of treatment residuals, if generated, to an approved disposal facility.
- Monitoring and evaluation of the effectiveness of the groundwater extraction system in achieving progress toward cleanup standards, and
- Expansion of the system if data on the performance of the system indicates that expansion is necessary to make progress toward cleanup standards.

State Concurrence:

The State of Wisconsin concurs with the selected remedy. The letter of concurrence is attached to the Record of Decision (ROD) package.

Declaration:

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technology to the maximum extent practicable for this site. Because this remedy will result in hazardous substances remaining on-site above the health-based levels, a review will be conducted within 5 years after commencement of remedial action, to ensure that the remedy continues to provide adequate protection of human health and the environment.

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Date	Valdas V. Adamkus Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
MUSKEGO SANITARY LANDFILL SITE
MUSKEGO, WISCONSIN

TABLE OF CONTENTS

SUMMARY OF FINAL REMEDIAL ACTION
GROUNDWATER REMEDY

MUSKEGO SANITARY LANDFILL SITE
MUSKEGO, WISCONSIN

I. SITE NAME AND LOCATION

The Muskego Sanitary Landfill Superfund site occupies approximately 56 acres north of State Highway 24 (Janesville Road), and east of Crowbar Road in the City of Muskego, Waukesha County, Wisconsin. The site is located in Southeastern Wisconsin approximately fifteen miles southwest of the City of Milwaukee (see Figure 0). More specifically the site is southwest of the urbanized portions of the City of Muskego by roughly three miles. The Site includes three areas known as the "Old Fill Area", the "Southeast Fill Area" and the "Non-Contiguous Fill Area" (see Figure 1). The site also includes wastewater ponds associated with a former rendering plant complex (the "Anamax plant"). Portions of the property associated with the Anamax plant are also included in the Old and Southeast Fill Area boundaries. Directly north of the site is the Stoneridge Landfill, a closed and covered solid waste landfill, that is not part of the Superfund site. Land use to the west of the site is for sand and gravel excavation. To the south, east and north of the site, the land use is a combination of residential and agricultural. The area surrounding the Site is semi-rural, but is zoned to permit further development in the future. Several homes and businesses are in the vicinity of the property, and many were once served by individual private water supply wells. In the late 1980s, city water mains were extended into the area and several homes and businesses were connected. Currently, two residences southeast of the site are not connected to public water. These residences are indicated in Figure 1.

The Muskego Sanitary Landfill Site is situated on unconsolidated deposits that are up to 300 feet thick and are generally comprised of glacial till, outwash, and lacustrine deposits. Site investigative information and private well boring logs show layers of fine-grained material (till and lacustrine deposits) south and east of the site to depths of about 70 to 200 feet and coarse grained material (outwash) below the till to depths of about 200 to 300 feet below land surface.

There are three principal sources of groundwater in Waukesha County. In order of depth below the land surface they are: sand and gravel within the glacial drift, Niagara dolomite, and an underlying sandstone. In the Muskego area, a majority of the private wells are finished in the thick sand and gravel deposits. The water table for this shallow aquifer is approximately 20 to 40 feet deep and has produced yields as high as 2,000 gal/min. The depth of the upper glacial drift is about 300 feet which corresponds to the aquifer thickness. The groundwater classification for this aquifer is Class IIA (i.e., is used for human consumption purposes and is not restricted).

In the Muskego area, groundwater flow in the water table shallow aquifer is generally in an easterly to southeasterly direction. This is similar to the groundwater flow at the site, which has two flow paths. The first is in a north to south direction under the eastern portion of the Old Fill Area where the basal clay unit separates the sand and gravel unit from the landfill. The second flow path is generally to the southeast under the Southeast and Non-Contiguous Fill Areas. These flowpaths are separated by a groundwater divide that was created by the advancement of the Oak Creek Till formation from the east. A sand and gravel seam to the southeast is separated from the larger outwash to the south and west of the site by the more impermeable clay layer.

The site is located within the Fox River watershed, just south of a local surface divide. There are numerous wetlands in the area and the closest off site intermittent stream is located about three-quarters of a mile to the southeast. None of the wetlands are located within the site boundaries. Surface drainage at the site is divided between flow to the

wetlands and the intermittent stream to the southeast. Surface water runoff from the Old Fill Area is to the ditch along Crowbar Road or to the southeast through a small swale. The western half of the Southeast Fill Area also drains to this swale which eventually discharges to a small wetland north of an abandoned railroad right-of-way. Runoff from the neighboring Anamax property, the Non-Contiguous Fill Area, Stoneridge Landfill, and the eastern half of the Southeast Fill Area is toward the ditch along the service road to a small wetland southeast of the site and then through a culvert under Highway 24 to a larger wetland. The site is located within the 100 year floodplain.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Site History

The 38-acre Old Fill Area accepted material from the mid-1950s until 1977. An unknown amount of waste oils, paint products, and other wastes were deposited into the Old Fill Area during this time. The Southeast Fill Area which covers about 16 acres, accepted only municipal wastes during its operation from 1977 to 1981. The Non-Contiguous Fill Area includes a drum trench, north and south refuse trenches, and an L-shaped fill area. This Non-Contiguous Fill Area occupies approximately 4.2 acres northeast of the Old Fill Area. Based on information from workers employed during operation of the landfill, the L-shaped Fill Area is expected to contain waste similar to that in the Old Fill Area.

In response to deteriorating water quality at on-site groundwater monitoring wells, sampling of off site private water supply wells was conducted in 1982 and 1984 by the site operator, Waste Management of Wisconsin, Inc. (WMWI), and Wisconsin Department of Natural Resources (WDNR). The results of these analyses indicated that several of the private wells may have been impacted by a source of contamination, which could have been the landfill and/or the Anamax wastewater lagoons. The results were based on elevated indicator parameters. The test for indicator parameters is a preliminary test completed to show signs of groundwater contamination. In 1986 public water was extended to this area and private wells in the area were connected to this supply. The site was evaluated and ranked by the United States Environmental Protection Agency (U.S. EPA) and placed on the National Priorities List (NPL) on September 18, 1985.

In 1985, a partial methane extraction system was installed by WMWI along the western portion of the Old Fill Area to alleviate methane gas migration that was noted at the site. The extracted gas is destroyed through flaring.

B. Response Actions

During preparation of a portion of the Phase I Stoneridge Landfill area called Module III, which is due east of the Non-Contiguous Fill Area, buried drums were discovered in a pit. The drums and contaminated soils were excavated by Chemical Waste Management, Inc., under the supervision of WDNR, and transported to the Adams Center Landfill in Ft. Wayne, Indiana. Also liquid wastes from the excavation and drums were transported to the SCA Incinerator in Chicago, Illinois. The contaminated soils were excavated until contaminant concentrations in subsequent soil sample were below action levels established by WDNR.

During the Remedial Investigation (RI), a trench was discovered in a portion of the Non-Contiguous Fill Area that contained a large concentration of 55-gallon drums. The boundary of this Drum Trench area was further defined using a magnetometer metal detector.

Through a Unilateral Administrative Order issued on January 4, 1991, U.S. EPA ordered WMWI to remove the drums and surrounding contaminated soils. WMWI proceeded to conduct this removal under U.S. EPA's supervision. Excavation of the drum trench began in April 1991 and was completed in May 1991. A total of 989 drums were excavated along with approximately 2,500 cubic yards of surrounding contaminated soil. The soils were excavated down to a depth of approximately 25 feet below the original surface elevation until groundwater was encountered.

The drum trench was re-filled to a grade that allowed drainage away from the area. No final soil clean-up levels were established for this removal action since the excavation reached groundwater in portions of the trench. Therefore a majority of the soil was removed. Soil samples were taken in the remaining areas above the water table at the base of the trench and contamination was found. This remaining contamination was addressed in the Interim Action Source Control Operable Unit (SCOU) Record of Decision (ROD).

Below is a list of contaminants that were found from a representative sample of liquid collected from excavated drums on the staging pad on April 17, 1991. The list below shows contaminants that were above detection limits. The detection limits for all contaminants were elevated due to sample concentrations.

Benzene	Chloroform	Ethyl Benzene
Toluene	Trichloroethene	Methylene Chloride

Some of the other contaminants that were sampled for and found but not quantified because of elevated detection limits include; vinyl chloride, tetrachloroethene, 1,2-dichloroethane, and 1,1-dichloroethene. Contaminants found within the drum trench are contaminants that are present in monitoring wells at the Site.

The liquids from the excavated drums were separated, bulked, and disposed of through either a fuels blending program or incineration. The liquids used in the blending program were sent was Solvent Resource Recovery facility in West Carrolton, Ohio and incinerated liquids were processed at Aptus Environmental Services in Coffeyville, Kansas. A majority of the soils were disposed of in a hazardous waste cell unit at the Calumet Industrial Design Landfill (CID) in Calumet City, IL. Solids remaining in the drums were tested, bulked and accepted at a fuels blending facility in April of 1992 for repackaging. The solids totaled approximately 15 cubic yards and were then sent to a facility in Texas for incineration. The disposal procedures occurred from October 1991 through April 1992.

C. Remedial Investigation/Feasibility Study (RI/FS)

On September 17, 1987, WMWI signed an Administrative Order on Consent with U.S. EPA to conduct a Remedial Investigation/Feasibility Study (RI/FS) for the site. The purpose of the RI was to identify sources of contamination and to characterize the contamination at the site. The RI was finalized on November 4, 1992. The Final RI includes a Baseline Risk Assessment which was conducted to characterize the current and potential threat to public health and the environment at the site. To focus and expedite clean-up of the site, the project was divided into two operable units - the Source Control Operable Unit (SCOU) and the Groundwater Operable Unit (GWOU) or Final Remedy. The SCOU focused on removing and containing remaining contaminants in on-site soils to minimize the further spread of contamination; the GWOU focuses on cleaning up contamination in groundwater at the site.

A Source Control Operable Unit FS was prepared in September 1991. That FS provided a detailed analysis of alternatives evaluated for the interim action SCOU. The SCOU remedy proceeded as an interim remedial action even before the Baseline Risk Assessment and RI were completed. The FS for the GWOU was prepared in March 1993. The alternatives developed in this FS are presented in the Description of Alternatives, Section VII. Together with the SCOU, this GWOU constitutes the Final Remedy for the Site.

D. Remedial Design/Remedial Action

In December 1992 a Record of Decision was signed for the Source Control Operable Unit (SCOU) action at the site. This action includes the design and installation of a 2 foot clay cap over the waste areas, expanding the current leachate and gas extraction system over the entire site, constructing an In-situ Soil Vapor Extraction (ISVE) system in the area of the drum removal and groundwater monitoring.

On December 9, 1991, U.S. EPA issued a Unilateral Administrative Order requiring 46 identified potentially responsible parties (PRPs) to perform the SCOU remedy. Those PRPs included Carl Wauer (the site owner), WMWI (the site operator for a period of time when hazardous substances were disposed of), and 44 generators of hazardous substances disposed of at the site. The vast majority of these parties complied with the order and implemented the SCOU remedy.

The Remedial Design for this SCOU work was completed and approved in October 1993 and work began that same month. The entire project was completed by October 1994 with minor field modifications that included the removal of an underground storage tank and approximately fifteen buried drums. Prior to the construction of the clay cap, several buildings from the Anamax Rendering facility, which has been acquired by WMWI, were demolished with the debris consolidated on site. Full-time operation of the dual extraction wells for leachate and landfill gas began in November 1994. Groundwater monitoring under the Interim Groundwater Monitoring Plan (IGMP) began in April 1994 and will continue until a long-term monitoring plan is designed and approved as part of the Groundwater Remedy described in this ROD.

III. COMMUNITY PARTICIPATION

The U.S. EPA released its Proposed Plan for the final remedy for the Site in October 1994, and has made it available for public review and comment. The Proposed Plan and supporting documents have been made available at the information repositories at the U.S. EPA Region V offices, the Muskego Public Library, and the Muskego City Hall. U.S. EPA has been placing relevant information in these repositories since 1987. Notice of the availability of the Proposed Plan was included in advertisements in the Muskego Sun, Hales Corners Hub, and Waukesha Freeman in September 1994. Press releases were also sent to local media. Before reaching a final decision on how the site contamination would be addressed for this action, U.S. EPA held a public meeting on October 17, 1994 at the Muskego City Hall. At this meeting, representatives of U.S. EPA and WDNR answered questions about the proposed remedy and accepted formal comments from the public on the Proposed Plan and remedial alternatives. U.S. EPA also accepted written comments during the comment period, which originally ran from October 2, to November 2, 1994. A request for extension of the comment period was submitted on November 2nd and accepted. The 30 day extension moved the end of the public comment period to December 2, 1994. A response to all comments received during the public comment period is contained in the Responsiveness Summary, which is attached to this the ROD.

Other community relations activities were associated with the Source Control Operable Unit (SCOU) Proposed Plan and the RI/FS. The first comment period was held from August 28 to September 27, 1987 concerning the signing of the RI/FS consent order. Press releases announcing this comment period were sent to local media. A community relations plan was finalized in early 1988. A "kickoff" meeting to discuss the initiation of the RI was held at the Muskego City Hall on Aug. 25, 1988. Advertisements and press releases were sent to local media. A fact sheet was developed and sent to everyone on the U.S. EPA's mailing list.

In June 1991, a press release concerning U.S. EPA's drum removal project was issued and a fact sheet was developed and sent to everyone on the mailing list. This fact sheet served as a notice of activities associated with the drum removal and as an overall update on site activities.

On December 12, 1991, U.S. EPA held a public meeting for the SCOU Proposed Plan at the Muskego City Hall. At this meeting, representatives for U.S. EPA and WDNR answered questions about the proposed remedy and accepted formal comments from the public. U.S. EPA also accepted written comments during the comment period, which ran from November 18, to December 18, 1991. The SCOU ROD contained a response to all comments received during the public comment period.

Fact Sheets describing actions at the Site were released in July 1993 and June 1994. These annual informational updates were sent to community representatives, concerned citizens, and local media. These Fact Sheets have served as the primary sources of information for the

community since the comment period for the SCOU ROD. The objectives of these fact sheets were to provide information on the SCOU construction activities, to describe progress towards the Final Remedy, and to serve as a reminder to local residents of whom they may contact to answer questions regarding the site.

IV. SCOPE OF GROUNDWATER REMEDIAL ACTION

The Groundwater Operable Unit (GWOU) is intended to be the final response action for this site. The action will directly address on-site groundwater contamination concerns and control the threat to off-site wells by containing and remediating contaminated groundwater. These concerns arise both from existing contamination and from further contamination that may migrate from source areas on-site.

As with many Superfund sites, the problems at the Muskego Sanitary Landfill are complex. Early site characterization activities conducted as part of the RI identified sources of contamination that could be addressed before full characterization activities were complete. Therefore, to accelerate the remediation of the sources of contamination, U.S. EPA, in consultation with WDNR, organized the work into two operable units (OUs).

The first operable unit, the Interim Action SCOU, addressed contamination movement into the groundwater and soils from sources within the Old, Southeast, and Non-Contiguous Fill Areas. These areas pose a threat to human health and the environment because of the risks from possible ingestion of, or dermal contact with, contaminated soils located there or possible ingestion of, or dermal contact with, contaminated groundwater at private residences downgradient of the Site. Based on sampling by the U.S. EPA in August 1991, there were no current impacts of Volatile Organic Compounds (VOCs) at private wells downgradient of the Site. However, the threat of future impacts to private well exists since downgradient monitoring wells have shown contamination.

The first purpose of the SCOU response was to prevent current or future exposure to the contaminated soils and to reduce contaminant migration into the groundwater that is a current source of drinking water for local residents. The second purpose of this response was to prevent current or future exposure to landfill gas containing explosive and potentially toxic contaminants and to reduce the migration of landfill gasses to adjacent soils and structures.

The combination of this action along with the previous actions is intended to address the entire site with respect to the current and potential future threats to human health identified in the RI, FS, and site Baseline Risk Assessment.

V. SITE CHARACTERISTICS

A. Geology and Hydrogeology

The site is located in an area of thick glacial drift overlying Niagara dolomite. The drift thickness varies from approximately 300 feet on the east edge of the site to 50 feet at a location about 2,000 feet south of the site. The site overlies a deep valley in the bedrock that is part of the Troy Valley which trends to the east with a steep bedrock slope rising to the south.

The valley in the bedrock beneath the site is filled with sediments consisting of sand and gravel with a cover of glacial till. In general, fine-grained material (till and lacustrine deposits) south and east of the site extend to depths of approximately 70 to 200 feet. Below the till is coarse material (outwash) which extends to depths of about 200 to 300 feet below land surface.

At the northern portion of the site is the Upper New Berlin Formation which is a till deposit forming an east-west tending moraine. The New Berlin Formation contains two principal members, a lower sand and gravel unit and an upper till unit. The western portion of the site consists of the lower outwash sand and gravel unit that extends southwest from the site

toward the Fox River. The upper unit is typically gravel, sand, loam till that averages about 58 percent sand, 29 percent silt, and 13 percent clay.

The sand and gravel deposits are present east of Crowbar Road and south of the landfill access road, beneath the western edge of the site, and extend east to the boundary of the basal clay under the Old Fill Area (Figure 2).

Above the New Berlin formation is the Oak Creek Formation which consists of a much finer textured composition of fine-grained till, lacustrine clay, silt, and sand. This formation on an average consists of approximately an 85 percent clay-silt composition. The western limit of the Oak Creek Formation is the Valparaiso Moraine and ends within the Old Fill Area. The western extent of the clay till and other low permeability material is vertically and horizontally irregular. As a result, its extent cannot be accurately defined, nor can an edge of low permeability material of constant thickness be mapped with an acceptable degree of certainty. The approximate Basal Layer Boundary is outlined in Figure 2.

The glacial sediments in the area are underlain by the Silurian-aged Niagara dolomite, at depths between 250 to 350 feet below land surface. The Niagara dolomite is sequentially underlain by Maquoketa shale, dolomites, sandstones, and igneous and metamorphic rocks. The Maquoketa shale in the Site area is documented by private well logs which indicate there is about 200 feet of shale below the Niagara Dolomite.

The groundwater flow in the site area varies in direction due to the complex geological features. The general groundwater flow for the region is from the north to the south. Within unconsolidated areas located at the northern and western edges of the site, the groundwater moves in a southerly direction. However the geology by the Southeast and Old Fill Areas consists of consolidated clay layers. Therefore perched groundwater conditions exist in these areas. Groundwater flows radially in all directions from these areas. (Figure 3) Groundwater from the northern portion of the site near the old rendering plant lagoons is split by a low groundwater divide in the sand and gravel deposits. One flow path moves generally along a Southeast route that is directed beneath the Non-Contiguous Fill Area, the Southeast Fill Area and the Anamax plant. The other flow path moves generally along a southern route that is directed under the Old Fill Area.

Similar to the groundwater flow, the water table in the site area also varies due to complex geological features. Since the site is located at the end of two glacial advancements, the Berlin and Oakcreek formations, consolidated clay layers are intermixed with unconsolidated sand and gravel. Since the permeability of these soils varies so does the water table. Therefore the water table at the site is from 20 to 40 feet deep. In areas where groundwater is perched or leachate is held within the basal layer the water table is 20 to 30 feet deep.

Presently, the main aquifer in the sand and gravel unit is used for private water supply downgradient of the site in only two private residences. Public water was provided to the Site area in 1986 along Janesville Road to the South and Hillendale Avenue to the east. The municipal well system is located a few miles east of the site and is not near, nor is it affected, by the site.

Hydraulic conductivity varies throughout the site depending on the soil type. Within the clay till, the hydraulic conductivity ranges from 1.6 x 10-6 centimeters per second (cm/s) to 5.1 x 10-9 cm/s. However, the hydraulic conductivity of the sand and gravel deposits is much higher, ranging from 3.9 x 10-2 cm/s to 1.2 x 10-3 cm/s.

B. Nature and Extent of Contamination

The RI sampling of groundwater was conducted at monitoring wells and private wells throughout the site. Since April 1994 groundwater monitoring has been conducted under the Interim Groundwater Monitoring Plan (IGMP) which will continue until a long term monitoring plan is implemented under this ROD. The IGMP includes semi-annual sampling of volatiles, semi-volatiles and inorganics. Quarterly sampling for indicator parameters is also performed

under the IGMP. During the IGMP several monitoring wells throughout the site were abandoned due to poor well construction quality, SCOU remedial activities, or various factors. Since this work was completed after this FS was drafted these wells are not reflected as abandoned in the tables and figures for this ROD but a description of the IGMP has been included as Attachment A.

Groundwater

Groundwater is the main pathway of concern for contaminant migration at the site. As mentioned above, there are two main groundwater flow paths. The first one, known as the Southern flow path, runs from the northern section of the site under the Old Fill Area and continues to the south. The second or Southeast flow path, also moves from the northern portion of the Site, but is diverted to the southeast and flows beneath the Southeast Fill Area, the Non-Contiguous Fill Area and Anamax property. In addition, conditions exist where leachate accumulates in areas above these flow paths in perched or elevated conditions (Figure 3). A summary of the organic group results for all monitoring wells at the site is listed in Table 1.

Southern Flow Path - The Southern Flow Path is potentially affected by the former rendering plant lagoons, and the Old and Non-Contiguous Fill Areas. Two rounds of groundwater sampling occurred at 12 downgradient wells at seven different locations. A summary of U.S. EPA MCL and WDNR NR 140 exceedances is provided in Table 2; locations of the monitoring wells are shown in Figure 4.

Organic contamination located in the Southern Flow Path includes BETX (benzene, ethylbenzene, toluene, xylene), chlorinated ethene, and chlorinated ethane groups. Individual chemical concentrations and well locations are listed below.

Constituent	Concentration	Well Location
Benzene	1 ug/L	135A
Toluene	3 ug/L	123B
Ethylbenzene	3 ug/L	123B
Xylene	1-13 ug/L	123B, 96 P
Tetrachloroethene	1 ug/L	123B
Trichloroethene	1-3 ug/L	123B, 135B, 138A
1,2-Dichloroethene	1-8 ug/L	135A-B, 137A-B, 96
Chloroethane	2 ug/L	135A
1,2-Dichloroethane	2 ug/L	135A, 137A
1,1-Dichloroethane	1-5 ug/L	135A-B, 137A-B, 95P, 96

Semi-volatile compounds and pesticides/PCBs were not detected in the Round I groundwater samples collected from the Southern Flow Path. Therefore, Round 2 samples were not analyzed for these parameters.

Groundwater monitoring wells were also sampled for Target Analyte List (TAL) metals and cyanide, and general groundwater quality indicators. These analyses were used to assess chemical concentration trends within the aquifer to aid in the determination of groundwater flow patterns, and contaminant fate and migration.

There are seven TAL constituents that were detected in one or more monitoring well sample(s) along the Southern or Southeastern Flow Paths at levels higher than those detected in the background wells E80 and TW75. All of these seven were detected along the Southern Flow Path at various wells. The constituents were as follows:

- Arsenic
- Lead
- Zinc
- Barium
- Manganese
- Chromium
- Nickel

Southeast Flow Path - The Southeast Flow Path which diverts from the Southern Flow Path in the northern area of the site, was characterized using 11 monitoring wells at six locations.

The organic compound sampling from these wells are summarized in Table 1; locations of the monitoring wells are shown in Figure 5.

There are four organic contaminant groups that were detected on-site along the Southeast Flow Path. These groups are BETXs , chlorinated ethenes, chlorinated ethanes, and phthalates. Individual concentrations and well locations are listed below. One organic contaminant, vinyl chloride, was found off-site, at levels in exceedance of Federal Maximum Contaminant Levels (MCLs) and state NR 140 Enforcement Standards (ESs) as shown in Table 3. The vinyl chloride contamination was found during groundwater monitoring southeast of the Site at Well P64C.

Constituent	Concentration	Well Location
Benzene	1 ug/L	92A
Xylene	1 ug/L	92P
Trichloroethene	2-3 ug/L	92A
1,2-Dichloroethene	2-3 ug/L	92A
Vinyl Chloride	5-7 ug/L	64C
1,2-Dichloroethane	2 ug/L	92A
1,1-Dichloroethane	6-7 ug/L	92A

Additional organic compounds detected in this area include 1,2-dichloropropane from monitoring well E92A at a concentration of 2 ug/L (Rounds 1 and 2); and methylene chloride (a common/probable laboratory contaminant), at well TW62 at a concentration of 2 ug/L (Round 1 only).

Phthalates were detected in one groundwater sample from this area during Round 1 (E92-3 ug/L), and two samples from Round 2 (E94-4 ug/L, and TW62-3 ug/L). Constituent compounds detected were di-n-octyl phthalate and bis (2-ethylhexyl)phthalate.

As with the Southern Flow Path, pesticides/PCBs were not detected in Round 1 groundwater samples collected from this area. Therefore, Round 2 samples were not analyzed for these parameters.

There are five TAL constituents that were detected in one or more monitoring well sample(s) along the Southeastern Flow Path at levels higher than those detected in the background wells E80 and TW75. These constituents are as follows:

- Arsenic
- Zinc
- Barium
- Manganese
- Nickel

Other areas - The Southern and Southeast Flow Paths described above affect well locations primarily downgradient from the site as shown in Figures 4 and 5.

Monitoring wells are also located in the Non-Contiguous Fill and Anamax plant areas as well as along the northern extent of the Old Fill Area (Figures 6 and 7). The highest concentration of organic contamination for the site was found at wells in the Non-Contiguous Fill Area. Specifically, monitoring well E136, located in the Non-Contiguous Fill Area, was contaminated with several VOCs at levels in exceedance of MCLs and ESs as shown in Table 4.

Contaminant groups that were detected within the Non-Contiguous Fill Area, Anamax plant and northern boundary areas include BETXs, chlorinated ethenes, chlorinated ethanes, ketones, phenols, and polycyclic aromatic hydrocarbons (PAHs). Some of the individual concentrations and well locations are listed below.

Constituent	Concentration	Well Location
Benzene	1-21 ug/L	100A, 102A, 104, 97P, TW74R, 87
Toluene	8-12,000 ug/L	102A, 136
Ethylbenzene	270-7,300 ug/L	102A, 136
Xylene	5-39,000 ug/L	102A, 136
Tetrachloroethene	3 ug/L	17R
Trichloroethene	1-7 ug/L	87, 100A, 104, TW74R
1,2-Dichloroethene	1-12 ug/L	100A, 102A, 104, TW74R, 87
1,2-Dichloroethane	3-9 ug/L	102A, 87
1,1-Dichloroethane	3-8 ug/L	100A, 102A, 104, 87, 97P
Chloroethane	8 ug/L	97P
2-Butanone	9-2,400 ug/L	136, TW74R

Two additional volatile compounds were detected in wells along the northern boundary of the Old Fill Area. These included 1,2-dichloropropane at 5 ug/L from well E17R, and tetrahydrofuran from E48 at 41 ug/L. A summary of U.S. EPA MCL and WDNR NR 140 exceedances in groundwater along the northern wells is provided in Table 5.

Individual semi-volatile constituent compounds included phenol (870 ug/L), 4-methylphenol (2,100 ug/L), and naphthalene (360 ug/L) from well E136; 4-methylphenol (5 ug/L) and benzoic acid (6 ug/L) from well TW74R; and 2,4-dimethylphenol (2 ug/L) from well E102A. Along the northern boundary wells, only di-n-butyl phthalate was detected from well 90 at 2 ug/L.

Pesticides/PCBs were not detected in Round 1 groundwater samples collected from these areas. Therefore, Round 2 samples were not analyzed for these parameters.

There are TAL constituents that were found in one or more monitoring well sample(s) in these areas at levels greater than levels found in background wells E80 and TW75. These constituents are as follows:

• Arsenic • Chromium • Lead • Manganese

Private Wells - Many of the private wells near the site have been sampled several times during the history of operation at the site. Sampling during pre-RI/FS activities by Warzyn, WMWI's contractor, on May 3, 1991 and by U.S. EPA on August 28, 1991, showed that nearby water supplies were not impacted, at that time, by site-related contaminants. Locations of the nearby private wells are shown in Figure 8. All private well sampling results are included in Appendix K of the RI.

Soil

The results of the soil and sediment sampling were explained in detail in the SCOU ROD, which focused on soil and sediment contamination. The primary constituents of concern in soil are: benzene, toluene, xylene, ketones, phenols and polynuclear aromatic hydrocarbons (PAHs).

Air

The RI did not generate useable data on ambient air, leachate head well and gas vent vapor emissions. The requirement for landfill gas collection and treatment, NR 506.08 Wisconsin Administrative Code (WAC), has been addressed by implementation of a landfill gas management system as part of the SCOU remedy. This system should control any releases to the air from the waste material and there are no further expected sources of air contamination from the site. Air monitoring and treatment may be required depending on the installation of groundwater treatment systems. Air emissions resulting from a groundwater treatment system would be regulated by NR 445, Wis. Adm. Code. At this time treatment of air emissions from a groundwater treatment system, such as an air stripper, is not expected to be necessary.

Surface Water

Topographic highs in the vicinity of the site consist of a large end moraine north and northeast, and two topographic highs created by the Stoneridge facility and the Southeast Fill Area. The natural topographic high acts as a surface water divide. The majority of the runoff from the site flows to the southeast to two wetland areas and to an intermittent stream. Runoff from the western portion of the Old Fill Area flows to Crowbar Road on the west end of the site.

Surface water is not a significant contaminant migration pathway at the site due to the lack of permanent surface water features and the presence of newly placed cover soils, which will generally prevent contact of surface-water runoff with refuse. Sampling of surface water was not conducted during the RI.

VI. SUMMARY OF SITE RISKS

The Comprehensive Environmental Response Compensation and Liability Act (CERCLA) , 42 U.S.C. §§ 9601 et seq., requires that U.S. EPA protect human health and the environment from current and potential exposure to releases of hazardous substances at or from the site. As part of the RI, a Baseline Risk Assessment is required in order to assess the current and potential future risks by the Site. The baseline risk assessment determines whether contamination at the landfill could pose an unacceptable health risk or environmental risk in the absence of any remedial action. Potential threats to public health are estimated by making assumptions about the manner, frequency and length of time a person could be exposed to site-related contaminants.

This Baseline Risk Assessment was prepared in a manner consistent with U.S. EPA policy, as expressed in "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions," dated April 22, 1991. The quantitative risk assessment examined contaminants detected in groundwater, leachate, and soils during the field investigation phase of the RI. These contaminants were evaluated with respect to their carcinogenicity, toxicity, and possible exposure pathways from and at the site.

A. Identification of Chemicals of Potential Concern

The purpose of selecting chemicals of potential concern for the risk assessment is to identify those chemicals present at the site most likely to be of concern to human health and the environment. Since the Final Remedy addresses groundwater, the following is a list of contaminants detected in soil and groundwater at and near the site. The following codes are used to identify the various groundwater well location areas around the site where contamination was located.

Non-contiguous Fill Area/Former Anamax Facility - NC
Southeast Flow Path - SE
Southern Flow Path - SO
Northern Boundary - NB

Organics:

Benzene - NC,SE,SO,NB
2-Butanone - NC
Chloroform - NC
Di-n-butylphtalate - NB
1,2-Dichloroethane - NC,SE,SO,NB
1,2-Dichloropropane SE,SO,NB
bis(2-Ethylhexyl)phthalate - SE
Ethylbenzene - NC,SO
Naphthalene - NC
Pyrene - SO

Benzoic Acid - NC
Chloroethane - NC,SO,
Di-n-octyl Phthalate - SE
1,1-Dichloroethane - NC,SE,SO,NB
1,2-Dichloroethene - NC,SE,SO,NB
2,4-Dimethylphenol - NC
Dichlorofluoromethane - NC, SE,SO
4-Methylphenol - NC
Phenol - NC
Pentachlorophenol - SO

Tetrachloroethene - NB
Tetrahydrofuran - NB
Toluene - NC
Trichloroethene - NC,SE,SO,NB
Vinyl Chloride - SE
Xylenes (totai)- NC, SE, SO

Inorganics:

Aluminum - NC
Arsenic - NC,SE,SO,NB
Barium - NC,SO, SE,NB
Cadmium - NC
Calcium - NC,SE,SO,NB
Chloride - NC,SE,SO,NB
Chromium - NC,SO
Cobalt - NC,SE,SO,NB
Copper - NC,SO
Iron - NC,SE,SO,NB
Lead NC,SO,SE,NB
Magnesium - NC
Manganese - NC,SO,SE,NB
Nickel - NC,SE,SO,NB
Potassium - SE,SO
Silver - NC,NB
Selenium - SE,SO
Sodium - SE,SO,NB
Sulfate - SE
Thallium - SO
Vanadium - NC
Zinc - NC,SE,SO

Of the chemicals in groundwater, those which exceeded the Safe Drinking Water Act or state NR 140 WAC groundwater standards are shown in Tables 2, 3 and 4. This Table compares the maximum groundwater concentrations in the immediate source areas with the MCLs, state NR 140 Enforcement Standards (ESs) and Preventive Action Limits (PALs).

Based on toxicological studies, benzene and vinyl chloride are classified as U.S. EPA Group A - human carcinogens; while trichloroethene, tetrachloroethene and pentachlorophenol are classified as Group B2 - probable human carcinogens. Typically, exceedances of drinking water standards (such as the MCLs) may justify the need for remedial action. The Baseline Risk Assessment reinforces the existence of a potential threat to public health, welfare or the environment. Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

B. Exposure Assessment

The objective of an exposure assessment is to estimate the type and magnitude of exposures to constituents of potential concern that are present or are emanating from the site. There are two scenarios to consider for an exposure assessment. The first is a current use scenario and the second is a reasonable future use scenario. This assessment will be focused on groundwater since the SCOU has already limited exposures through all other media. In order to complete an exposure assessment the exposure pathways must be identified. An exposure pathway must include the following four elements; (1) a source and mechanism of chemical release to the environment, (2) a transport media (e.g. groundwater), (3) an exposure point, and finally, (4) an exposure route such as ingestion or inhalation at the contact point. In summary, the exposure assessment is a review of how contamination may come in contact with living organisms via groundwater.

Groundwater Pathways - Current use scenario

Site-related chemicals have been detected in the sand and gravel aquifer in the immediate area of the source areas. The potential exists for this contamination to move with groundwater flow toward private residences. However, at this time there are no currently active residential wells on or nearby the site. Two downgradient private wells screened in the sand and gravel aquifer are available for non-potable uses. These wells were included in the August 1991 sampling conducted by the U.S. EPA which did not detect any VOCs in private water supplies. One of these wells has since been sampled as part of the Interim Groundwater Monitoring Plan (IGMP) and also has not shown any detections of VOCs. There is no indication that these wells were impacted by site-related chemicals, and therefore, groundwater was not evaluated under a current use scenario. However, the IGMP did verify that contaminants are still present in monitoring wells downgradient of the source areas.

Future use scenario

According to the National Contingency Plan (NCP), a no-action alternative must address changes of land use associated with the site which may result in exposure and risk to the chemicals of potential concern. Table 6 (4,2 in Risk Assessment of RI) summarizes the exposure pathway analysis for future site use conditions. This table can also be found in Section 4 of the Baseline Risk Assessment of the RI. Since the SCOU has been completed the only direct exposure media of concern are groundwater.

Under future-use conditions, the assumption was made that a hypothetical well would be constructed on-site or immediately downgradient from the site in either of the two primary flow paths and would be used for water consumption. Therefore, future residents could be exposed via ingestion of site-related chemicals from drinking water and inhalation of volatile chemicals while showering. Dermal absorption is not being considered because it is less significant than the other two groundwater exposure routes. Cumulative risk is driven primarily by potential ingestion of groundwater and inhalation of shower water. Therefore the addition of the dermal absorption scenario would not impact the cumulative risk. From these scenarios, assumptions can be made so as to quantify the risk scenarios. These estimates and assumptions are provided in the Toxicity Assessment section of the risk assessment.

C. Toxicity Assessment

The Toxicity Assessment explains contamination levels, risk levels and potential carcinogenic effects for contaminants of concern. Risk levels show the potential for increased cancer effects based on a lifetime exposure of the contaminants known to cause cancer. Based on U.S. EPA risk assessment guidance, exposures are quantified by estimating the reasonable maximum exposure (RME) associated with the pathway of concern. An acceptable risk range for the U.S. EPA according to the NCP is 10-4 to 10-6. This means a range of increased cancer frequency from one additional person out of 10,000 to 1 out of 1,000,000 people. Risks from non-carcinogenic health hazards are based on a Hazard Index value. The Hazard Index value is calculated on the exposure amount compared to a Reference Dosage. Reference Dosage guidelines are established by U.S. EPA. Hazard Index values greater than 1 indicate there may be potential health risks associated with exposure to the chemicals evaluated.

Ingestion of Groundwater

Drinking water exposures for a hypothetical future resident located on-site and downgradient from the site were evaluated. Chronic daily intakes were calculated for residential drinking water exposures using the RI monitoring data for the Non-Contiguous Fill Area, Southeast Flow Path and Southern Flow Path data groupings. The exposure parameters for this pathway are presented in Table 7 (Table 4-16 in BRA of RI). Exposures were assumed to occur 350 days/year, with the residents living in the same location from birth to age 30 out of their 70-year expected lifetime.

The resulting Chronic Daily Intake (CDI) levels for chemicals exhibiting carcinogenic effects and chemicals exhibiting noncarcinogenic effects due to ingestion of groundwater were calculated. These values were then taken and used to estimate the total future scenario risk presented in section D.

Inhalation While Showering

Inhalation exposures to volatile chemicals while showering with groundwater were calculated for hypothetical future residents. The exposure parameters for inhalation of volatiles from showering by residents are presented in Table 8 (Table 4-20 in BRA of RI)).

These are standard parameters used by U.S. EPA to assess this pathway. These parameters include an exposure time of 17 minutes, a frequency of exposure of 350 days/year, an exposure duration of 30 years, and an expected lifetime of 70 years. The exposure point concentrations were calculated using a shower model described in Appendix B of the RI. The resulting risk

from these calculations is explained in the Risk Characterization section below.

D. Risk Characterization

The objective of this section of the assessment is to present and evaluate the human health risks potentially associated with ingestion of groundwater and inhalation of volatile organics while showering. By taking the chronic daily intakes (CDI) and inhalation exposure concentrations (IECs) and combining them with the health effects criteria, a risk level can be calculated for the site. The risk level of 1x10-6 represents an upper bound probability of one in one million that an individual could contract cancer due to exposure to the potential carcinogen under the specified exposure conditions.

In reviewing a future risk scenario, the following conditions were assumed in order to determine the risk.

1. A private well would be installed downgradient of the Site in the Southeast Flow path.

2. Concentrations similar to the Vinyl Chloride levels found in monitoring wells where contamination was found would be detected in the private wells installed.

3. 1.6 liters of water would be consumed 350 days per year for 30 years.

4. The body weight of the individual drinking the water is 48 kilograms (106 pounds) and the average lifetime would be 70 years.

Using these assumptions in combination with site data, an individual drinking groundwater under these conditions would have a 1 in 10,000 (10-4) chance of obtaining cancer. This estimation is for carcinogenic compounds only.

Potential risks for noncarcinogens are presented as the ratio of the CDI to the reference dose (CDI:RfD) for each chemical, or as the ratio of the IEC to the reference dose concentration (IEC:RfC). The sum of the ratios of all chemicals under consideration is called the hazard index. The hazard index is useful as a reference point for gauging the potential effects of environmental exposures to complex mixtures. In general, hazard indices which are less than one are not likely to be associated with any health risks, and are therefore less likely to be of regulatory concern than hazard indices greater than one.

The summary of potential health risks associated with the site under the future land use assumptions are provided in Table 9 (Table 5-17 BRA of RI or Table 33 of FS). This table includes both carcinogenic and non-carcinogenic effects. The cumulative risk for the Non-Contiguous Fill Area is 6 x 10-4 or six additional cancer cases in ten thousand people. The cumulative risk for the Southeast Flow Path is 1 x 10-4 or one additional cancer case in ten thousand people. The cumulative risk for the Southern Flow Path is 8 x 10-6 or eight additional cancer cases in one million people.

Southeast Flow Path

The risk associated with the Southeast Flow Path is predominantly due to the presence of Vinyl Chloride. Vinyl Chloride is a known carcinogen and therefore is estimated with a higher weight for causing cancer. Vinyl Chloride was found in one well above MCLs and ESs during both rounds of the RI. Results from the IGMP indicate Vinyl Chloride was detected in two additional wells. The highest detection of Vinyl Chloride is 7ug/l in this flowpath. Therefore the risk associated with the Southeast Flow Path is primarily based on potential groundwater ingestion in this area over a prolonged time period.

Southern Flow Path

The upper bound lifetime excess cancer risk to a potential future resident through ingestion of groundwater from the Southern Flow Path wells is 6x10-6. This value is primarily due to

the presence of 1,2-dichloroethane and 1,2-dichloropropane detected in monitoring wells in this flow path. The hazard index for the southern flow path exceeds one (5) which is entirely due to thallium. Thallium was detected at 17ug/1. Exposure to thallium can be associated with elevated enzyme levels in blood serum and baldness.

Non-Contiguous Fill Area

The potential upper bound lifetime excess cancer risk to a future resident through ingestion of groundwater from the Non-Contiguous Fill Area wells is 6x10-4. This value is predominantly due to the presence of Arsenic in these wells. However, Benzene, 1,2-Dichloroethane, and Trichloroethene each have an upper bound lifetime excess cancer risk greater than 1x10-6 which is within the range U.S. EPA considers for taking remedial actions. The hazard index for the Non-Contiguous Fill Area is ten, which is well in excess of the level (one) where health effects are expected. The primary chemicals accounting for these results are 2-butanone, ethylbenzene, naphthalene, arsenic, and manganese. These results indicate that adverse noncarcinogenic effects could potentially occur if on-site groundwater from the Non-Contiguous Fill Area is ingested on a daily basis over many years.

The potential upper bound lifetime excess cancer risk to a future resident through inhalation of volatiles while showering with groundwater from the Non-Contiguous Fill Area is 1x10-5. This value is primarily due to the presence of benzene and 1,2-dichloroethane. Benzene was detected at concentrations ranging from 1 ug/L to 21 ug/1 in seven of 12 wells. Two detected concentrations of 1,2-dichloroethane (out of 12 samples) were 4 and 9 ug/1. The total hazard index exceeds one (9). This vague is primarily due to the presence of xylenes, but also included 1,1-Dichloroethane, Ethylbenzene and Toluene. Based on the potential exposure to xylenes, adverse noncarcinogenic effects could potentially occur to the central nervous system and respiratory tract if groundwater from this well is used for showering on a daily basis over many years.

E. Ecological Risk Assessment

The ecological risk assessment evaluates the potential impacts to nonhuman receptors associated with possible exposures to the chemicals identified in the human health assessment. This assessment is similar to the human risk assessment in that it identifies potential receptors, conducts an exposure and toxicity assessment and evaluates the risk characterization. Details of this process are provided in section 6 of Appendix A of the RI. Below is a brief overview of this section.

Potential receptors evaluated for this assessment include plants, birds, mammals, livestock, reptiles and amphibians. Since it is not feasible nor practical to assess impacts to every species potentially affected by exposure to chemicals of potential concern it is appropriate to select "indicator" species. These indicator species are representative of potential impacts in other species at the site.

Conclusions of the ecological assessment show that it is unlikely any adverse affects to aquatic invertebrates, birds and mammals, livestock, and sensitive species have occurred. The most important potential exposure pathway for ecological receptors at this site is associated with chemicals in sediments in the drainage way and the wetland area. There is some potential for adverse impacts to sensitive aquatic invertebrates from exposure to 4-methylphenol in drainage way sediments and phenol in wetland sediments. However, these chemicals have not been widely detected. Overall, absolute conclusions regarding the potential environmental impacts are difficult to make due to uncertainties surrounding the estimates of toxicity and exposure. Given the uncertainties and the relatively low levels of contaminants of concern in the drainage way and wetlands, it is unlikely any major adverse affects to the environment have occurred at the site. Based on completion of the SCOU remedy it is also very unlikely that any future adverse affects would occur.

F. Uncertainties

The estimates of risk for the site have several associated uncertainties. The primary sources of uncertainty are the following:

- Environmental sampling and analysis, and selection of chemicals
- Exposure parameter estimation
- Toxicological data

The risk assessment for this site should not be construed as presenting an absolute estimate of risk to persons potentially exposed to chemicals from the site. Rather, it is a conservative analysis intended to indicate the potential for adverse impacts to occur. Details regarding uncertainties and assumptions used in the risk assessment can be obtained in Section 7.0 of the Baseline Risk Assessment (Appendix A of the RI).

VII. DESCRIPTION OF ALTERNATIVES

A. Remedial Action Objectives

Upon completion of the source control operable unit remedial action, certain objectives that were developed during the RI have been addressed. These objectives include reducing leachate from entering the groundwater and reducing migration of contaminants from the source areas. These actions will contribute to attainment of the long-term goals of protecting human health and the environment and meeting applicable or relevant and appropriate requirements (ARARs). The main objective of this groundwater operable unit remedial action is to reduce and contain concentrations of contaminants in groundwater at the site thereby minimizing its migration. The clean-up goals for this site will be to meet Federal Maximum Contaminant Levels (MCLs), and state NR 140 Enforcement Standards (ESs) and Chapter NR 140 Preventive Action Limits (PALs). Since NR 140 PALs are the most stringent standards, these are the primary goals on which this action is based. Consistent with Section 300.430(a) (1) (iii) (F), U.S. EPA expects to return useable groundwater at the Site to beneficial use wherever practicable, with a timeframe that is reasonable given particular circumstances of the Site.

Since the SCOU remedy for this site has already been implemented, the Final Remedy specifically addresses the reduction of contaminant concentrations in groundwater at the site. A phased approach has been taken on this project in order to monitor progress toward clean-up objectives and to assess the additional impact of the SCOU remedy on groundwater contamination. Monitoring the progress achieved by the SCOU in effectuating clean-up goals, and documenting how such progress is measured, will also be objectives of this remedy.

B. Development of Alternatives

Alternatives developed in the FS for the Final Remedy considered all prior remedial actions implemented at this site. These actions include previous drum removals and work conducted under the SCOU. Consideration of these actions reflects a phased approach to project management that has been consistently used at this site. This phased approach allows the project to progress while simultaneously monitoring the effects of previous work. This same approach will be used to document the progress and attainment of groundwater clean-up goals.

The remedial alternatives were assembled from applicable remedial technology options. A wide range of technologies and remedial options were reduced by evaluating them with respect to technical implementability. The alternatives surviving the initial screening were evaluated and compared with respect to the nine criteria required by the NCP. In addition to the remedial action alternatives, the NCP requires that a no-action alternative also be considered for the site. The no-action alternative serves primarily as a point of comparison for other alternatives.

The strategy used to develop alternatives was to first provide general response actions typical for groundwater remediation. These actions include:

- Institutional Controls
- Groundwater Monitoring
- Groundwater Controls
- Groundwater Treatment
- Groundwater Discharge

These general response actions describe a variety of institutional controls and remedial actions intended to satisfy the groundwater objectives. These general actions were screened to evaluate which were implementable prior to comparison to the NCP criteria.

Institutional Controls

Institutional controls include deed restrictions and land use planning. The purpose of these controls is to restrict development and/or installation of water supply wells in the vicinity of impacted groundwater. Deed restrictions have been placed on the property parcels where the fill areas are located. These parcels are owned by the Respondents (WMWI and Mr. Carl Wauer) and the restrictions placed in accordance with the SCOU remedy. Also, according to State regulations, the installation of a water supply well in a known contaminated aquifer or within 1,200 feet of the nearest edge of an abandoned landfill is prohibited, unless a variance is granted by the WDNR. However, deed restrictions can only be implemented by a property owner thereby limiting the effectiveness of this requirement. Since deed restrictions are already in place for the required properties there is no need for any additional restrictions for this remedy. Enforcement of the water supply well prohibition is dependent on the property owner or well driller contacting the WDNR prior to well installation. Also, the WDNR can grant variances from the prohibition, so the prohibition is not absolute, even if the WDNR is contacted. Therefore, the effectiveness of institutional controls relating to water supply well prohibition is dependant upon the site owner or contractor contacting the WDNR, and is not absolute, even if the WDNR is contacted.

Groundwater Monitoring

Currently groundwater monitoring is ongoing from the SCOU under the Interim Groundwater Monitoring Plan. The goals of a groundwater monitoring program, without additional groundwater extraction, are to monitor changes in groundwater contaminant concentrations within the identified flowpaths, and evaluate the effectiveness of the SCOU activities. In addition to these goals, a long-term monitoring program that includes groundwater extraction and treatment would include:

- Provide data to assess the extraction well capture zone,
- Evaluate the effects on the groundwater from discharge to an infiltration basin,
- Evaluate trends in groundwater contamination and the impact of any activities associated with this remedy.

Groundwater Controls

Groundwater controls are active means by which contamination within the groundwater would be contained, reduced and/or eliminated. Certain controls were evaluated but disregarded due to implementability considerations. These include: 1) underground barriers to reduce groundwater migration from the site; 2) groundwater extraction trenches; and 3) groundwater control by injection for enhancement of biological degradation. Geological features at this site prevent underground barriers and groundwater extraction trenches from reducing migration away from the site. The New Berlin and Oak Creek Formations intersect in the area of the site thereby creating a complicated pattern of clay and sand seams. This pattern creates an intricate groundwater flow configuration around the site. Therefore a single barrier or extraction system such as a wall would not adequately impact multiple flow paths. Biological degradation may not be effective because in-situ bioremediation is not appropriate for large quantities of water containing generally low concentrations of chlorinated aliphatic hydrocarbons.

Groundwater controls that were retained for evaluation include: 1) groundwater extraction wells; and 2) groundwater extraction wells with injection of uncontaminated water through an

infiltration basin or trench. These controls were retained due to their potential effectiveness at reducing contaminated groundwater and the implementability of these specific actions.

Groundwater Treatment

Groundwater treatment was separated into inorganic and organic treatment technologies. For the purpose of technology screening, the discharge limits for extracted groundwater are evaluated relative to Chapter NR 140 PALs. Technologies related to treatment of inorganic parameters include precipitation, reverse osmosis, ion exchange, and reduction.

Technologies related to the treatment of organics in groundwater include biological treatment, oxidation, photolysis, air and steam stripping, spray evaporation, carbon adsorption, and thermal destruction. Due to low concentrations of organic contaminants biological treatment, photolysis, air and steam stripping, and thermal destruction would not be the most effective technologies comparatively and therefore were not retained.

Groundwater Discharge

Discharge of treated water to surface or groundwater, or discharge of untreated or pretreated water to a Publicly Owned Treatment Works (POTW) can provide a means of disposal for the extracted groundwater. Surface water discharge areas that were considered included the Fox River, approximately 1 mile west of the site, or wetlands southeast of the site. Groundwater reinjection was not retained due to the possibility of raising the water table near the Stoneridge Facility and the source areas. However, groundwater infiltration was retained since the impact on elevating the water table would be less than direct reinjection. Discharge to a wetland or groundwater infiltration must meet Best Available Technology (BAT) requirements under ch. NR 220, Wis. Adm. Code, in the effluent and NR 140 requirements in the groundwater below the discharge area. Discharge to a wetland is similar to an infiltration basin but is more ecologically sensitive and would require more stringent monitoring. Therefore, discharge to wetlands was not retained. Discharge standards to a surface water body such as the Fox River would not require similarly stringent standards. Therefore, surface water discharge to the Fox River and infiltration basin discharge locations were retained for consideration for treated water. POTW discharge was retained for non-treated extracted water.

C. Alternatives

Alternative 1 - No Action

Under Alternative 1 no additional corrective action would be taken at the site to address groundwater contamination. The removal of leachate from the Southeast Fill Area, Old Fill Area, and Non-Contiguous Fill Area would continue utilizing the current method of pumping leachate from the existing collection system directly to the sanitary sewer. The gas collection and flaring would also continue as described in the SCOU. The newly constructed landfill cap would minimize infiltration of rain water through waste. In situ vapor extraction would continue in portions of the Non-Contiguous Fill Area. Finally, deed restrictions that restrict potential well installation on-site or nearby would continue.

Under a no-action scenario, contamination in the groundwater would not be directly addressed. This would result in continued off-site migration of existing contaminants in the groundwater. Also, contaminants would potentially move into groundwater from the source areas. In particular, leachate extraction wells were not installed in the Non-Contiguous Fill area because leachate head levels in the area were not high enough to allow extraction to be practicable.

A no-action remedy would allow the site to remain as it exists today. Therefore, contamination within the aquifer would be addressed primarily through attenuation and dispersion without active restoration. There would be no capital or operational costs

associated with this alternative, beyond those associated with the SCOU.

Alternative 2 - Long-Term Performance Monitoring

The Long-Term Performance Monitoring Alternative involves monitoring of groundwater quality over time to evaluate the effectiveness and performance of the previous activities performed at the site. No groundwater remedial action would be taken as a result of this alternative. The groundwater monitoring program would incorporate the Interim Groundwater Monitoring Plan (IGMP) and is assumed to include the installation of additional wells during the remedial action. The actual number of sampling locations, the sampling frequency, and the parameter list, would be determined during the Remedial Design.

The Long-term monitoring program would provide information on groundwater conditions throughout the site. This alternative would not provide additional protective measures nor directly address groundwater standard exceedances. The capital cost for this alternative would be $145,000 with Operation & Maintenance costs at $161,000 per annum for an estimated 30 years resulting in a Net Present Value of $2,620,000.

Alternative 3 - Non-Contiguous Fill Area Groundwater Extraction and Treatment (The Selected Remedy)

The purpose of this alternative is to directly address, through groundwater extraction and treatment, the groundwater contamination identified primarily in the vicinity of the Non-Contiguous Fill Area. By reducing contaminant input to the Southern and Southeastern Flow Paths from the Non-Contiguous Fill Area, which is where the highest concentrations of contaminants were found on-site, health risks from groundwater downgradient of the Fill areas would be reduced and clean-up standards would be expected to be reached over time through reduction of contamination in the groundwater pathways and through natural means.

Major components of Remedial Alternative

The major features of this alternative include a system which pumps and treats contaminated groundwater near the Non-Contiguous Fill Area, starting at a rate of approximately 50 gallons per minute (gpm), with a discharge to an on-site infiltration basin. Treatment for VOCs and inorganics would include air stripping, an acid wash of the air stripper, when necessary, with possible inclusion of chemical precipitation. If necessary, carbon treatment would be installed to comply with air emission standards (NR 445, Wis. Adm. Code). Transportation of treatment residuals would be to an approved facility. The treated water may initially be discharged, on a short-term basis, to the local POTW until treatment systems are appropriately designed. Long-term groundwater monitoring would be conducted both in the vicinity of the Non-contiguous Fill Area and in the South and Southeast flow paths to evaluate effectiveness and determine if contingency measures are necessary to achieve groundwater clean-up goals (NR 140, Wis. Adm. Code) in all of these areas.

Alternative 3 would be implemented in a phased approach in order to gather the necessary data to determine the progress towards, and achievement of, clean-up objectives. This approach is consistent with the approach to the overall site and parallels U.S. EPA guidance for "Evaluating the Technical Impracticability of Ground-Water Restoration", September 1993. The implementation of a limited pump and treat system in the Non-Contiguous Fill Area would occur in conjunction with a comprehensive pilot scale test. The purpose of this test would be to determine aquifer characteristics and evaluate discharge and treatment options.

Another goal for this alternative will be to continue updating the estimate of the time frame needed to reach clean-up objectives. Currently, it is difficult to assess the impact of the SCOU on helping achieve groundwater clean-up. This will be facilitated through continued, long-term performance monitoring at the site. The Performance Evaluation Report would include a section that evaluates remedial action performance data from the site and the progress toward achieving clean-up objectives. This section would be updated on at least a 5 year periodic basis and will include recommendations on implementing additional remedial actions, or improvements to the operation of the existing environmental controls.

This alternative currently contemplates the installation of four extraction wells downgradient of the North and South Refuse Trenches and the L-Shaped Fill Area. The actual number and location of extraction wells and extraction flow rates will be determined after pilot-scale testing of the system. The total estimated extracted flow rate is now assumed to be 50 gallons per minute. This rate may be adjusted, depending on the results of the pilot testing. A header pipe system would connect these wells to a treatment system. Parameters anticipated to exceed discharge standards include some VOCs, iron, manganese, and possibly arsenic. Appropriate treatment of extracted groundwater is air stripping for VOC treatment. The air stripper would be sized to reduce VOC concentrations to prescribed effluent limits. If necessary, further treatment would be added to meet applicable air emissions limits. Potential clogging of the treatment system caused by iron and manganese precipitates would be a maintenance concern and could be treated by periodic acid rinses of the unit, instead of pretreating the influent using chemical precipitation. However, if inorganic contaminant concentrations continue to exceed clean-up standards, then precipitation or other inorganic treatment technology, such as ion exchange, would be evaluated. The costs for this alternative assume chemical precipitation will be included.

Off-site discharge to a POTW, such as Milwaukee Metropolitan Sewerage District (MMSD), may be appropriate until extracted groundwater is characterized and confirmation is obtained that it can be treated to levels adequate to permit discharge to an infiltration basin. The cost for this alternative assumes discharge during the first year of groundwater extraction would be directly to MMSD. On-site treatment using air stripping would begin the second year of groundwater extraction.

Discharge to an infiltration basin would meet ch.-NR 220, Wis. Adm. Code, WPDES Best Available Technology (BAT) requirements, at the point of discharge and ch. NR 140, Wis. Adm. Code, PALs for all contaminants in the groundwater at a point directly below the discharge zone. To the extent it is subsequently determined that it is not technically or economically feasible to achieve PALs, NR 140.28 provides substantive standards for granting exemptions from the requirement to achieve PALs. Such exemption levels may not be higher than the ESs.

Alternative 3 is planned to capture existing groundwater contaminants and prevent additional migration of contaminants from this source through contaminant removal and containment. The Southern and Southeast Flow Paths would both be affected by this action. The impact of this action in combination with the SCOU cannot be precisely determined at this time. One of the goals of this action will be to measure the effectiveness of this action coupled with the SCOU remedy to determine progress towards achieving clean-up goals.

The capital cost for this alternative is estimated to be $1.2 million. The operation and maintenance costs have a total present value of approximately $6.2 million over a thirty year period. Therefore the total Present Value Cost for this alternative is $7.4 million.

Alternative 4: Non-Contiguous Fill Area and Perimeter Groundwater Extraction and Treatment

Alternative 4 contains 3 options. The options are based on the two groundwater flow paths known as the Southern and Southeast Flow Paths. Alternative 4A addresses contamination in the Southeast Flow Path through groundwater extraction and treatment. Alternative 4B addresses contamination in the Southern Flow Path through the same means. Alternative 4 combines 4A and 4B to address all downgradient groundwater flow. All of the options also include pumping and treating contaminated groundwater from the Non-Contiguous Fill Area as provided in Alternative 3. The purposes of this alternative are: 1) to directly address groundwater contamination within the Southern and Southeast Flow Paths through hydraulic containment and groundwater extraction; 2) to reduce related risk in this groundwater to acceptable levels and; 3) to reduce groundwater contamination in the vicinity of the Non-Contiguous Fill Area.

Major Elements of Alternative

The major elements of these alternatives include: groundwater monitoring, extraction of contaminated groundwater, treatment and discharge. This alternative has been divided into options that address the Southern and Southeast groundwater flows both separately and

combined. The extracted groundwater generated under Alternative 4, would exceed the capacity of the infiltration basin, which is limited to an estimated 100-200 gpm. The same is true for Alternatives 4A and 4B.

Similar to Alternative 3, this alternative would have the goal of meeting U.S. EPA's Groundwater Protection Strategy. In addition, the groundwater monitoring data may be used to suggest adjustments to the system to achieve clean-up standards.

Alternative 4A (Southeast Flow Path)

Alternative 4A assumes that 6 extraction wells averaging 100 feet deep (3 wells at 70 feet deep, 3 wells at 130 feet deep) would be installed. The total extracted flow rate for the southeast perimeter extraction system is assumed to be 60 gpm. The actual number of extraction wells and flow rate needed to accomplish the purposes of this alternative would be determined during the Remedial Design. Similar to Alternative 3, treatment for VOCs and inorganics would include air stripping, acid washing of the air stripper, when necessary, and possible inclusion of chemical precipitation or ion exchange. Potential clogging of the treatment system (air stripping tower) caused by iron and manganese is a maintenance concern and would be treated periodically by acid rinsing the unit. If necessary, carbon treatment would be installed to comply with air emission standards (NR 445, Wis. Adm. Code) and transportation of residuals to an approved facility. The discharge of treated water would be to an on-site infiltration basin and/or to the Fox River. This decision would be dependent on information obtained during the Remedial Design regarding capacity constraints of the infiltration basin and impacts on the groundwater table. Any discharge to the Fox River would likely require a ROD Amendment and public comment.

The capital cost for this alternative is estimated to be $3.026 million. The operation and maintenance costs have a total present value of approximately $842,000 over a thirty year period. Therefore the total Present Value Cost for this alternative is $14.9 million.

Alternative 4B: (Southern Flow Path)

Alternative 4B specifically addresses contamination in the Southern Flow Path through groundwater extraction and treatment. The extraction system is assumed to include 5 extraction wells averaging 160 ft. deep. The total extracted flow for the south perimeter extraction system is assumed to be 125 gpm. This combined with the flow rate from the Non-Contiguous Fill Area would total 175 gpm. The FS (Appendix G) provides calculations indicating that the proposed basin size is large enough to handle the combined flow volume of 235 gpm. However, these calculations do not take into account the reduction in permeability due to sediment build-up and potential icing during the winter, affects on raising the groundwater table, and current capacity of the basin for stormwater and run-off from other local features. Therefore an appropriate range for discharge is between 100 and 200 gpm. Discharge to a second point may be necessary. Any discharge to the Fox River would likely require a ROD Amendment and public comment.

The capital cost for this alternative is estimated to be $3.207 million. The operation and maintenance costs have a total present value of approximately $896,000 over a thirty year period. Therefore the total Present Value Cost for this alternative is $15.8 million.

Alternative 4: (Southeast and Southern Flow Paths)

Alternative 4 is a combination of Alternatives 4A and 4B. The total extracted flow for this perimeter extraction system in combination with the Non-Contiguous Fill Area is assumed to be 245 gpm. This extraction system would most likely require discharge to the Fox River due to capacity constraints associated with the infiltration basin. Discharges of extracted groundwater to the river are subject to the Wisconsin Pollutant Discharge Elimination System (WPDES) program. Any discharge to the Fox River would likely require a ROD Amendment and public comment.

Potential discharge to the MMSD may be feasible for the low volume, more highly contaminated water collected at the start of extraction from the Non-Contiguous Fill Area. Any discharge to MMSD would have to meet MMSD pretreatment and volume requirements. The actual number of wells, flow rate, treatment system, and discharge system would be determined during the Remedial Design phase.

Discharge to an infiltration basin would meet WPDES Best Available Technology (BAT) requirements (214.12), at the point of discharge and ch. NR 140, Wis. Adm. Code, PALs for all contaminants in the groundwater at a point directly below the discharge zone. To the extent it is subsequently determined that it is not technically or economically feasible to achieve PALs, NR 140.28 provides substantive standards for granting exemptions from the requirement to achieve PALs. Such exemption levels may not be higher than the ESs.

The capital cost for this alternative is estimated to be $3.464 million. The operation and maintenance costs have a total present value of approximately $950,000 over a thirty year period. Therefore the total Present Value Cost for this alternative is $16.7 million.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Introduction

U.S. EPA has established nine criteria that balance health, technical, and cost considerations to determine the most appropriate alternative. The criteria analyze the selected remedy so that the remedy is protective of human health and the environment, attains ARARs, is cost effective, and utilizes permanent solutions and treatment technologies to the maximum extent practicable. The remedial alternatives developed in the FS have been evaluated and compared using these nine criteria which are set forth in the NCP at 40 CFR Part 300.430 (e) (9) (iii). These nine criteria are summarized as follows:

OVERALL PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) addresses whether a remedy will meet all other Federal and State environmental statutes and regulations and/or provides grounds for invoking a waiver.

LONG-TERM EFFECTIVENESS AND PERMANENCE refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up standards have been met.

REDUCTION OF CONTAMINANT TOXICITY, MOBILITY, OR VOLUME through treatment addresses the anticipated performance of the treatment technologies a remedy may employ.

SHORT-TERM EFFECTIVENESS addresses the period of time needed to achieve protection, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until clean-up standards are achieved.

IMPLEMENTABILITY addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

COST includes estimated initial capital, operation and maintenance (O&M) costs, and net present worth costs.

STATE ACCEPTANCE indicates whether, based on its review of the RI/FS and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative at the present time.

COMMUNITY ACCEPTANCE is based on comments received from the public during the public comment period. These comments are assessed in the responsiveness summary attached to this ROD.

B. Remedial Alternatives for Groundwater Remediation

The following briefly describes how the selected alternative for groundwater remediation compares to other alternatives using the nine criteria.

1. Threshold Criteria

The two most important criteria are statutory requirements that must be satisfied by any alternative in order for it to be eligible for selection. These two criteria are discussed below.

a. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

This final remedy addresses groundwater, therefore the discussion of protection of human health and the environment pertains specifically to the groundwater media. The SCOU has addressed risk from direct contact and air media scenarios. According to the Baseline Risk Assessment within the RI, the cancer risk under current land use conditions is within acceptable U.S. EPA ranges. However, the future risk scenario indicates risk to potential future groundwater drinking wells both on the site and downgradient. Therefore protection of human health and the environment is addressed from a potential future use scenario as opposed to a current use scenario.

Alternatives 1 and 2 are not protective of human health and the environment due to the continued movement of groundwater contamination and potential human exposure via future private wells.

Alternative 3 would provide appropriate protection since it addresses contamination in the groundwater in the vicinity of the Non-Contiguous Fill Area. The extraction system is anticipated to capture existing groundwater and prevent additional migration of contaminants. The Southern and Southeast Flow Paths would be affected by remedial activities proposed for the Non-Contiguous Fill Area, because the Non-Contiguous Fill Area is upgradient of both Flow Paths. Alternative 3 does not directly address, through groundwater extraction and treatment, contamination in exceedance of groundwater standards beyond the Non-Contiguous Fill Area.

However, contamination and potential risk in groundwater use scenarios are greater in the Non-Contiguous Fill Area. Therefore reduction of contamination in groundwater in this area coupled with the SCOU activities are expected to lower groundwater contaminant levels and therefore reduce associated potential risk levels. If subsequent monitoring shows that the contaminant levels are not being reduced adequately, this alternative allows for additional remedial actions, including actions that may be similar to those described in Alternative 4, to be implemented in a phased manner. The way in which additional extraction and treatment may be phased in is discussed in detail in the description of the selected remedy and the compliance with ARARs criteria, below.

Alternative 4 would also provide protection by controlling groundwater flow to a greater extent than any other alternative. This Alternative includes groundwater extraction to capture existing contaminants and prevent additional migration of contaminants associated with the Non-Contiguous Fill Area, Southeast Flow Path (Alternative 4A) and Southern Flow Path (Alternative 4B). At this time it is difficult to measure the difference in the effect on groundwater contamination that Alternative 4 would provide over Alternative 3. Since the Non-Contiguous Fill Area has higher contaminant concentrations than the Southern and Southeast Flow Paths the additional reduction of contamination produced by extraction in these areas is unknown. However, Alternative 4 provides the only method for immediate direct extraction of contamination from all sources.

Protectiveness of human health and the environment for all alternatives are based on the Baseline Risk Assessment (BRA). The BRA evaluates risk under two scenarios; current land use conditions and potential future land use. Currently there are no private residences using the groundwater aquifer since a public water supply has been constructed. Therefore the current risk scenario is negligible. For all alternatives, the contaminated areas of the aquifer would remain unusable during the period of restoration. The alternatives are enhanced in their effectiveness in protecting public health by the implementation of the Source-Control Operable Unit remedial components.

b. COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Alternatives 1 & 2 do not include groundwater extraction and treatment to directly address the identified State and Federal groundwater exceedances. These alternatives rely upon the SCOU remedial components to reduce contaminant (leachate) loading into the groundwater, and periodic monitoring to provide information on changing conditions at the site. While the SCOU activities will enhance groundwater clean-up through reducing contaminant loading, it will not address any current contamination within the aquifer. Alternatives 1 & 2 would rely on attenuation and dispersion as the means to achieve groundwater standards. U.S. EPA does not believe that these methods would be sufficient to meet the stated groundwater clean-up standards. Sections NR 140.24(2) and NR 140.26(2), Wis. Adm. Code, outline the response objectives that apply to this site. These sections require that contaminated groundwater be restored where technically and economically feasible, to achieve PALs. U.S. EPA does not believe Alternatives 1 & 2 would effectively restore groundwater within an appropriate timeframe. Active remediation of the groundwater is necessary at this site to achieve groundwater clean-up standards. Alternatives 1 & 2, if they could achieve standards over time (it is not known at this time if they would), would take many more years to achieve the standards than Alternatives 3 or 4. Therefore it is likely that Alternatives 1 & 2 would not comply with ARARs.

Alternative 3 directly addresses groundwater contamination through extraction and treatment of the main area of contamination - the Non-Contiguous Fill Area. The groundwater extraction and treatment in Alternative 3 addresses the most highly contaminated groundwater on site, which is upgradient of the Southeast and Southern Flow Paths containing lower levels of contamination. Alternative 3 relies upon natural attenuation to reduce existing groundwater contamination in those portions of the aquifer not addressed by groundwater extraction wells. Based on data from the RI, U.S. EPA believes that Alternative 3 would be more effective in addressing contamination in the Southeast Flow Path as compared to the Southern Flow Path. It is expected that the concentration of the ain contaminant in the Southeast Flow Path, Vinyl Chloride, would be reduced to comply with groundwater standards through this action. Moreover, a phased approach to Alternative 3 allows for the implementation of additional remedial actions, including the expansion of the scope and zone of influence of the groundwater pump and treat component if it is shown, through long-term groundwater monitoring, that groundwater ARARs are not being or will not be achieved. For example, if monitoring wells show, after a sufficient number of monitoring events, that state and federal groundwater standards are consistently met, the system could be turned off, in whole or part. If groundwater standards are not obtained, but a decreasing trend is shown, then the system would continue to be operated with continued monitoring. If contaminant concentrations stay at the same level or are increasing, then additional actions may be taken. These additional actions could include, but are not limited to: adjustments to the source control measures such as leachate extraction, alternate pumping or pulse pumping at current groundwater extraction wells, or installation of additional groundwater extraction wells in the areas addressed by Alternative 4. This final option may require an Explanation of Significant Difference or ROD Amendment if modifications have significant technical or cost implications. Determination of adequate progress towards clean-up goals will be measured periodically after system start up. The first evaluation would occur within 5 years after the implementation of the SCOU actions.

Alternative 4 would also directly address groundwater contamination through extraction and treatment in the Non-Contiguous Fill Area, the Southeast Flow Path (4A), and the Southern Flow Path(4B). The groundwater extraction and treatment in Alternative 4 addresses the most

highly contaminated groundwater on site as well as the groundwater at the perimeter of the waste boundaries, which is the point of compliance for the groundwater standards. Alternative 4 would provide additional effectiveness over Alternative 3 and would satisfy the compliance with ARAR criteria. However, given the relatively low concentrations beyond the waste limits and the limited number of sampling rounds from the RI, the additional effectiveness in reaching clean-up objectives with Alternative 4 over Alternative 3 cannot be predicted at this time. The performance of a pump and treat system in Alternative 4 would be reviewed regularly to assess its effectiveness in achieving remediation goals.

2. Primary Balancing Criteria

Five primary balancing criteria are used to identify major trade-offs between the remedial alternatives which satisfy the two threshold criteria. These trade-offs are ultimately balanced to identify the preferred alternative and to select the final remedy. Because Alternatives 1 and 2 do not satisfy the threshold criteria, they will not be evaluated by the primary balancing criteria.

a. LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative 3 would include extraction of contaminated groundwater in the Non-Contiguous Fill Area that will also reduce the loading of contamination into both the Southern and Southeast Flow Paths. This reduction in loading, in combination with the reduction in loadings achieved by the SCOU remedial components, is expected to lower contaminant concentrations in these flow paths. Although this alternative does not directly remove contaminants downgradient of the Old Fill area and Southeast Fill area, U.S. EPA believes the present concentrations which are already close to MCLs would be attenuated through natural processes such as degradation, adsorption, and dilution. The contaminants found in these downgradient flow paths represent a potential future use risk of 1 x 10-4 and a hazard index greater than one. Additional information obtained from monitoring after the remedy has been installed will be used to confirm the clean-up time frame and the capability of the remedy to keep concentrations at or below clean-up objectives at all monitoring points. Alternative 3 would be supplemented, if necessary, through additional remedial actions, including expansion of the groundwater pump and treat action, to assure achievement of the clean-up standards. This Alternative, in combination with the previous actions, would provide long term effectiveness through minimizing the additional contaminants reaching the aquifer and continuous reduction of existing contaminants in the groundwater.

Alternative 4 would provide long term effectiveness similar to Alternative 3 with the addition of immediate groundwater extraction along the perimeter of the fill areas. The installation of extraction wells along the southern and/or southeast flow paths would further contain the movement of groundwater contamination currently in these areas and therefore potentially reduce concentrations in a shorter time period. However, long term effectiveness would not be substantially affected by Alternative 4 since the additional actions do not address the main source of contamination. The primary difference between Alternative 4 and Alternative 3 is that additional containment through extraction will occur in Alternative 4. Both alternatives would reduce the level of residual health risk associated with existing groundwater contamination in proportion to the reduction of groundwater contaminants removed from the aquifer. However, many of the organic and inorganic contaminants present are expected to be reduced to levels near the analytical detection limit in the extracted groundwater, causing difficulty in verifying the treatment's effectiveness in reaching clean-up standards.

b. REDUCTION IN TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternatives 3 and 4 provide groundwater extraction and treatment that is intended to remove and treat those contaminant concentrations from the aquifer and limit potential migration. Treatment would occur on all extracted groundwater through air stripping for VOCs and precipitation for inorganics. Air stripping is a proven technology in effectively removing VOCs from water as well as precipitation is a proven method for removing inorganics. There would be no difference in treatment technologies between Alternatives 3 and 4 as currently

proposed. However, under both alternatives, if results from the remedial design pilot test indicate that additional treatment is necessary to reach discharge standards then treatment technologies may be modified. Alternative 4, and to a lesser extent Alternatives 4A and 4B, would restrict mobility of groundwater contamination through hydraulic control of the aquifer to a greater extent than Alternative 3. Because the additional volume of groundwater addressed in Alternative 4 is not nearly as highly contaminated as the groundwater that would be addressed under Alternative 3, the additional contamination and risk reduction provided by Alternatives 4, 4A, and 4B is not proportional to the additional volumes extracted and cost expended.

c. SHORT-TERM EFFECTIVENESS

None of the alternatives would pose a substantial risk to the community, workers, or the environment during remedial actions. Precautionary actions, through the remedial action health and safety plan, would address risks to on-site workers and potential off-site risks posed by cleanup-related activities.

Installation of groundwater extraction wells, treatment facilities, and a discharge system can be accomplished in one construction season, with minimal disturbance of contaminated soils. This time frame may be extended, if necessary, to gather information during the remedial design pilot test and if supplemental activity is required in response to monitoring results. The risks of construction activities for Alternatives 3 and 4 are adequately managed through the use of personal protective equipment for
construction workers.

d. IMPLEMENTABILITY

Implementability refers to the technical and administrative feasibility of constructing and operating the remedy described in the alternative. Alternatives 3 & 4 would both be technically feasible alternatives. Groundwater extraction wells with air stripping for organics and precipitation for inorganics are common technologies that have been proven feasible and effective on numerous occasions. All materials and services required for either alternative would be readily available and therefore technical feasibility is not a concern for either alternative.

Alternative 3 would require discharge on-site to an infiltration basin. There would not be the institutional requirements of obtaining permission from local authorities or private citizens for this work. Assuming that discharge ARARs (specifically, BAT & PALs) were met for the State of Wisconsin, Alternative 3 would be administratively feasible. Under Alternatives 4, 4A or 4B, discharge of treated groundwater would likely take place at the Fox River. The reasoning for this discharge location is the effluent volume would likely be greater than the capacity of the on-site infiltration basin. Discharging treated groundwater to the Fox River could be difficult to execute for administrative reasons. The Cities of Muskego and Big Bend would need to approve the project as well as Waukesha County. In addition, easements would need to be obtained from several private property owners to construct the pipeline and lift/pump stations and a WPDES permit would be required. The pipeline would need to cross at least eight roads, including one county highway. Based on these factors the administrative feasibility of Alternatives 4, 4A and 4B would be questionable.

e. COSTS

The estimated costs for all of the FS alternatives are listed below. The first column list the capital or construction costs for the project. The second column are the costs to operate the remedial system once it is constructed. The final column is the Present Net Worth.

	Capital Cost	Annual O&M Costs	Total Cost
1.	0	0	0
2.	$145,000	$161,000	$ 2,620,000
3.	$1,218,000	$417,000	$ 7,410,000
4.	$3,464,000	$950,000	$ 16,700,000
4a.	$3,026,000	$842,000	$ 14,900,000
4b.	$3,207,000	$869,000	$ 15,800,000

The estimated time frame for Operation and Maintenance costs is 30 years with a 5% discount factor. As with all costs estimated in a Feasibility Study, a range of -30% to +50% is applicable to cover variations in actual cost.

3. Modifying Criteria

a. STATE ACCEPTANCE

The WDNR has been the support agency for the RI/FS and has reviewed this ROD. The WDNR concurs with the selected remedial action. In addition, the WDNR does not feel that Alternatives 1 or 2 are protective or would attain ARARs. Therefore, Alternatives 1 and 2 are not acceptable to the State. Sections NR 140.24(2) and NR 140.26(2), Wis. Adm. Code, outline the response objectives that apply to this site. These sections specify that contaminated groundwater be restored in a reasonable period of time, and, where technically and economically feasible, be restored to achieve PALs. Alternative 3 is acceptable to the WDNR given that there will be continuous monitoring and the requirement to take additional remedial actions to ensure progress towards achieving clean-up goals in a reasonable period of time. Specifically, a phased approach that allows adjustments to the SCOU and groundwater remedy is imperative for the State under Alternative 3. Alternative 4 is supported by the State as well.

b. COMMUNITY ACCEPTANCE

Comments have been submitted by the community, local government officials, and potentially responsible parties (PRPs). Issues presented in the comments were directed toward the inclusion of groundwater monitoring at private residences surrounding the site. Comments and responses to those comments are described in greater detail in the Responsiveness Summary attached to this ROD.

Alternative 4 would require additional public comment from the community, especially residents of Big Bend. Given the number of easements that would be required for installation of the discharge line it is expected that additional information would have to be provided to the community prior to the selection of this alternative, because that requirement was not sufficiently clear in the Proposed Plan.

C. Summary

Based on a comparison of the nine criteria, Alternatives 1 and 2 do not provide protection from all of the potential risks at the site and do not comply with ARARs. They therefore do not meet the threshold test for selection of a remedial alternative at the site. Alternative 3 would be protective of human health by addressing groundwater contamination in the Non-Contiguous Fill Area. Concentrations of contaminants were greatest in this area, so addressing that area would provide the most efficient reduction of groundwater contamination through extraction and treatment. In addition, groundwater from this area is connected to the Southern and Southeast flow paths. Addressing that area would contribute to the reduction of contaminants downgradient of the fill areas and help achieve clean-up goals at the point of compliance. Alternative 4, similar to Alternative 3, would fulfill both threshold criteria. Protectiveness to human health and the environment and compliance with ARARs would be provided through either of these groundwater extraction and containment remedies. As noted in

the Proposed Plan, an important element of compliance with these criteria for Alternative 3 is the implementation of additional measures if monitoring data demonstrates that the Alternative, in combination with the SCOU, is not contributing to achievement of groundwater clean-up standards in the South and Southeast flow paths.

Alternatives 3 and 4 would both satisfy the long term effectiveness and permanence criteria. Both alternatives would provide adequacy and reliability of controls and the magnitude of residual risk associated with these Alternatives is minimal. Treatment would be identical for Alternatives 3 and 4 in all respects except that Alternative 4 would treat a greater volume of water.

Construction of either Alternative 3 or 4 would not present any significant risk to the community. By following proper site safety procedures any risk commonly associated with this type of construction work would be alleviated. Environmental impacts would be minimal or non-existent assuming that proper handling and disposal procedures are followed. All of these factors contribute to both Alternatives satisfying the short-term effectiveness criteria.

Since Alternative 3 would require construction of a groundwater pump and treat system primarily within the property boundary there are no anticipated technical or administrative difficulties at this time. Extraction well installation, air stripping, and precipitation are standard technologies that would be technically feasible and practicable to construct. Therefore Alternative 3 would be implementable and satisfy this criteria. Alternative 4, however, would likely require agreements with two municipalities, Waukesha County, the WDNR and several private residences to construct a discharge pipeline from the site to the Fox River and obtain a WPDES discharge permit. While U.S. EPA has coordinated projects similar in nature, there are no assurances that these administrative requirements can be completed.

The Present Net Value costs for Alternative 3 total $7,410,000. Capital costs are estimated at $1,218,000 and operational costs at $417,000 per year for 30 years. Alternative 4 has Present Net Value costs as follows; $14,900,000 (4a, Southeast Flow Path), $15,800,000 (4b, Southern Flow Path), and $16,700,000 (4a & 4b). Costs for Alternative 4 are substantially greater than Alternative 3 due primarily to the greater costs for Operation and Maintenance over the 30 year period. The actual capital costs are similar for both alternatives. However the volume of extracted groundwater in Alternative 4 would be double the amount in Alternative 3. To the extent additional phases are required upon implementation of Alternative 3, the present value costs of Alternative 3 would still be significantly lower than Alternative 4 because: (1) expansion of the system would be deferred for several years, substantially reducing the present value of those costs; and (2) contaminant reductions achieved by the SCOU and operation of the system in the NCF area may permit any later phases to be more limited than what is anticipated in Alternative 4.

The WDNR concurs with Alternatives 3 and 4 but does not concur with either Alternative 1 or 2. WDNR does not believe alternatives 1 or 2 are protective of human health or comply with ARARs. However, Alternative 3 is acceptable to WDNR given that the remedy be implemented in a phased approach and that the effectiveness of the remedy is measured periodically, and would be expanded if necessary to achieve clean-up standards. The WDNR also concurs with Alternative 4 and believes this extraction and containment option provides the greatest chance of complying with ARARs in the shortest period of time. It is expected, however, that Alternative 3 would achieve compliance with groundwater ARARs in an acceptable time period at substantially lower cost.

IX. THE SELECTED REMEDY

Based on the evaluations of the alternatives, U.S. EPA and the State of Wisconsin believe that the selected remedy (Alternative 3) will be protective of human health and the environment, comply with ARARs, be cost effective, and will utilize permanent solutions to the maximum extent practicable.

The selected remedy includes:

- Groundwater monitoring,
- Groundwater pumping test(s),
- Groundwater extraction in the vicinity of the Non-Contiguous Fill Area,
- On-site treatment of extracted water for contaminants as deemed necessary from tests during remedial design,
- Discharge of treated water to an infiltration basin or MMSD, as deemed necessary during remedial design pilot tests,
- Disposal of treatment residuals, if necessary,
- Monitoring and evaluation of the effectiveness of the groundwater extraction system in achieving progress toward clean-up standards, and
- Expansion of the system if data on the performance of the system indicates that expansion is necessary to make progress toward clean-up standards.

Alternative 3 will be implemented in a phased approach in order to gather data to determine the progress achieved in effectuating clean-up objectives. Therefore implementation of limited pump and treat in the Non-Contiguous Fill Area would occur in conjunction with pilot scale phase testing to determine aquifer characteristics and evaluate discharge and treatment options. Groundwater monitoring will be conducted to correspond with the pilot scale testing and continue after the remedy is constructed. Monitoring results will be used to periodically evaluate effects of groundwater extraction on the contaminant plume. The monitoring results will also be used to better define the plume within the Non-Contiguous Fill Area and downgradient of this area. Additional measures to effectively evaluate groundwater plume and aquifer characteristics may be implemented as deemed necessary by U.S. EPA, in consultation with WDNR, during the pilot scale test.

Pre and post-test groundwater quality testing will be performed for treatment system design and evaluation purposes. A Pilot-Scale Evaluation Report (PER) will be submitted for approval by U.S. EPA, in consultation with WDNR. This report would outline the results of the pilot scale test and provide recommendations for treatment system design, discharge location and rates, monitoring locations and recommendations for additional action if sufficient progress toward achieving clean-up goals has not been attained. In addition, the PER would include a plan for measuring the progress towards clean-up goals. Attachment B, "Performance Evaluations for Pump and Treat Remediations" provides information on mathematical, statistical, or graphical methods to evaluate the performance of pump and treat remediations. This reference is consistent with U.S. EPA guidance "Methods for Monitoring Pump and Treat Performance" June 1994. The decision on which method is more suitable for the Muskego site will be based on the pilot scale test and will be made by U.S. EPA, in consultation with WDNR.

Any additional action beyond adjustments to the original groundwater extraction system and source control measures would require review by U.S. EPA in consultation with WDNR. Actions that would require an off-site surface water discharge of extracted water would likely require a ROD Amendment and therefore public comment would be solicited.

As previously mentioned, this alternative allows for contingency actions as determined necessary by U.S. EPA, in consultation with WDNR. The objective of the groundwater monitoring program will be to provide information in order to measure progress achieved in effectuating the clean-up objectives. Unless progress toward clean-up objectives has been demonstrated by the first periodic review, contingency actions will have to be implemented. For example, if monitoring wells show, after a sufficient number of monitoring events, that state and federal groundwater standards are consistently met, the system could be turned off. If groundwater standards are not obtained, but a decreasing trend is shown, then the system would continue to be operated with continued monitoring. If contaminant concentrations stay at the same level or are increasing, then contingency actions may be taken. These actions could include, but are not limited to: additional source control measures such as leachate extraction, alternate pumping or pulse pumping at current groundwater extraction wells, or installation of additional groundwater extraction wells. This final option may require an Explanation of Significant Difference or ROD Amendment if modifications have significant technical or cost

implications. Determination of adequate progress towards clean-up goals will be measured periodically after system start up. The first evaluation would occur within 5 years after the implementation of the SCOU actions. The clean-up goals for the site are the NR 140 Preventive Action Limits (PALs), which must be met at and beyond the waste boundaries (edge of waste). Consistent with Section 300.430 (a) (1) (iii) (F), U.S. EPA expects to return useable groundwater at the Site to beneficial use wherever practicable, within a timeframe that is reasonable given the particular circumstances of the Site.

A periodic review, as described in Alternative 3, will be prepared that evaluates all remedial actions performed at the site against clean-up objectives. These reviews will provide recommendations on implementing additional remedial actions, such as installing additional groundwater or leachate extraction wells, and/or adjusting current system operations. One goal of this alternative will be to estimate the time frame to reach clean-up objectives. This will be facilitated through continued, long-term performance monitoring of the site.

The remedial action objectives and clean-up goals for this Final Remedy are presented in Section VII of this ROD. The remedial action objectives include:

- Reduction of the migration of contaminants of concern from the Fill Areas.
- Reduction of the concentrations of contaminants of concern in groundwater at the site to acceptable risk levels.
- Reduction of groundwater concentrations of contaminants of concern at the site to meet Federal Maximum Contaminant Levels (MCLs) and State NR 140 Enforcement Standards (Ess) and Preventive Action Limits (PALs) at and beyond the waste boundaries (edge of waste).
- Return useable groundwater at the Site to beneficial use wherever practicable, within a timeframe that is reasonable given the circumstances of the Site.
- Further evaluation of the groundwater and plume characteristics in the Non-Contiguous Fill Area and downgradient of this area during pilot scale tests.

Table 10 lists a detailed cost summary for the selected remedy. U.S. EPA and the WDNR believe that the selected remedy, in combination with the previous actions, will achieve the remedial action objectives for this remedy. To the extent additional phases are required upon implementation of Alternative 3, the present value costs of Alternative 3 would still be significantly lower than Alternative 4 because: (1) expansion of the system would be deferred for several years, substantially reducing the present value of those costs; and (2) contaminant reductions achieved by the SCOU and operation of the system in the NCF area may permit any later phases to be more limited than what is anticipated in Alternative 4.

X. STATUTORY DETERMINATIONS

A. Protection of Human Health and the Environment

The selected remedy provides adequate protection of human health and the environment through a phased approach to groundwater monitoring, extraction and treatment. This builds on previous response actions which were designed to reduce possible sources for additional contamination of groundwater and to limit direct exposure to contamination.

As described in the SCOU ROD, the effect of the Site on wetlands located southeast of the Site have been mitigated through source controls. Extracting and containing contaminated groundwater should provide further protection for those wetlands.

The groundwater operable unit, building on the SCOU remedy, will attempt to restore groundwater to the State ESs and PALs and to Federal MCLs.

B. Attainment of ARARs

The selected remedy will be designed to meet all applicable, or relevant and appropriate requirements (ARARs) under federal, and more stringent state environmental laws. A list of

ARARs for the site is contained in the alternative arrays section of the FS. The primary ARARs that will be achieved by the selected alternative are:

1. Action Specific

Resource Conservation and Recovery Act, as amended [42 U.S.C. § 6901 et seq.]; Wisconsin Environmental Protection Law, Hazardous Waste Management Act [Wis. Star. § 144.60-74] Most RCRA requirements are administered under the State of Wisconsin's implementing regulations. U.S. EPA does not have sufficient evidence to demonstrate that listed RCRA wastes were disposed of at the site. RCRA requirements are therefore not applicable to the site, except to the extent that new hazardous wastes (such as treatment residuals) are generated during the course of the remedy. Several other RCRA regulations, although not applicable, address problems or circumstances very similar to those encountered at this site and are therefore relevant and appropriate. However, the remedy will comply with the following applicable requirements:

Wis. Admin. Code NR 605; 40 CFR 261 - Identification of Hazardous Wastes. Provides requirements for determining when a waste is hazardous. The substantive requirements of these regulations will apply to any on-site TCLP testing of treatment residuals and waste excavated at the site (e.g. in constructing wells) which may be disposed of off-site.

Wis. Admin. Code NR 615; 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste. Provides requirements for the shipment of wastes to treatment, storage or disposal facilities. These requirements may apply to on-site preparations for off-site shipment of treatment residuals and other wastes.

Wis. Admin. Code NR 620; Department of Transportation Hazardous Materials Transportation Act [49 U.S.C. § 1801]; 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste. Requires record keeping, reporting and manifesting of waste shipments. These requirements may apply to on-site preparations for off-site - shipment of treatment residuals and other wastes.

Wis. Admin. Code NR 630.10-17; 40 CFR 264, Subpart B - General Facility Requirements. Establishes substantive requirements for security, inspection, personnel training, and materials handling which are relevant and appropriate to on-site activities involving excavations and handling of hazardous soils and materials.

Wis. Admin. Code AIR 630.21-22; 40 CFR 264, Subpart D - Contingency Plan and Emergency Procedures. Establishes substantive requirements for emergency planning which are relevant and appropriate for on-site activities involving excavation and handling of hazardous substances.

Wis. Admin. Code NR 675; 40 CFR 268 - Land Disposal Restrictions. Requires that hazardous wastes cannot be land disposed unless they satisfy specified treatment standards and imposes record keeping requirements on such wastes. These requirements apply to on site activities related to off-site disposal of any treatment residues or other hazardous wastes.

Clean Water Act of 1977, as amended [33 U.S.C. S 1317] 40 CFR 403 - Pretreatment Standards. To the extent waste waters will be discharged into a Publicly Owned Treatment Works (POTW), the selected remedy would satisfy both general and specific requirements to protect against damage to POTWs. Any waste to be discharged to a POTW must, if necessary, be treated to satisfy these standards prior to discharge. These pretreatment requirements are administered under NR 211 and 108. The substantive requirements of these regulations will apply to collected groundwater to be discharged.

2. Chemical Specific

Clean Air Act [42 U.S.C. § 7401 et seq.]; Wisconsin Environmental Protection Law, Subchapter III-Air Pollution [Wis. Star. 144.30- 144.426] 40 CFR 50; Wis. Admin. Code NR 404, 415-449 - Emissions Standards. Establishes standards for emission of pollutants into the ambient air

and procedures for measuring specific air pollutants. Groundwater treatment or pretreatment may require removal of VOCs before discharge. The need for treatment of air emissions produced by this process would be evaluated based on substantive requirements of Wis. Admin. Code NR 445. If emissions are expected to exceed those standards, the selected remedy will include treatment of air emissions. Handling of contaminated soils during excavation could also cause air emissions of VOCs, particulates, fugitive dust or other contaminants which could adversely effect human health and the environment. The design of the remedy will reduce such emissions to acceptable levels or provide for treatment to satisfy these standards.

Safe Drinking Water Act [40 U.S.C. § 300 et seq.] 40 CFR 141, Wis. Admin. Code NR 109 - Maximum Contaminant Levels (MCLs) . MCLs establish drinking water standards for potential and actual drinking water sources. MCLs have been exceeded at the site in the shallow aquifer, which is classified as a potential drinking water source. The selected remedy, building on the SCOU remedy, is intended to achieve compliance with MCLs and non-zero Maximum Contaminant Level Goals.

Wis. Admin. Code NR 140 - Groundwater Quality Standards. Provides for groundwater quality standards including Preventive Action Limits (PALs), Enforcement Standards (ESs), and (Wisconsin) Alternative Concentration Limits (WACLs). The selected remedy, building on the SCOU remedy, is intended to achieve compliance with PALs at and beyond the waste boundary (edge of waste). To the extent it is subsequently determined that it is not technically or economically feasible to achieve PALs, NR 140.28 provides substantive standards for granting exemptions from the requirement to achieve PALs. Such exemption levels may not be higher than the ESs.

Discharge to an infiltration basin would meet ch. NR 220, Wis. Adm. Code, WPDES Best Available Technology (BAT) requirements, at the point of discharge and ch. NR 140, Wis. Adm. Code, PALs for all contaminants in the groundwater at a point directly below the discharge zone. To the extent it is subsequently determined that it is not technically or economically feasible to achieve PALs, NR 140.28 provides substantive standards for granting exemptions from the requirement to achieve PALs. Such exemption levels may not be higher than the ESs.

Resource Conservation and Recovery Act, as amended [42 U.S.C. § 6901 et seq.]; Wisconsin Environmental Protection Law, Hazardous Waste Management Act [Wis. star. S 144.60-74] Most RCRA requirements are administered under the State of Wisconsin's implementing regulations. U.S. EPA does not have sufficient evidence to demonstrate that listed RCRA wastes were disposed of at the site. These RCRA regulations, although not applicable, address problems or circumstances very similar to those encountered at this site and are therefore relevant and appropriate.

Wis. Admin. Code NR 635.09; 40 CFR 264.94 - Concentration limits. Establishes concentration limits in groundwater for certain hazardous constituents related to a hazardous waste management unit.

40 CFR 265.1032-33 - Air emissions standards for process vents. Establishes emissions standards for certain air stripper operations. If air stripping is used to remove VOCs from extracted groundwater, air stripper emissions would meet applicable standards under these regulations. As with the Clean Air Act standards described above, treatment of these air stripper emissions would be included if necessary to meet RCBA air emission standards.

Wisconsin Environmental Protection Law, Subchapter II-Water and Sewage [Wis. Star. § 144.02-27]; Clean Water Act of 1977, as amended [33 U.S.C. § 1311-17] Wis. Admin. Code NR 102 and 105 - Surface water quality standards. NR 102 creates an antidegradation policy for all waters of the State and prohibits toxic substances in surface waters at concentrations which adversely affect public health or welfare, present or prospective water supply uses, or protection of animal life. The selected remedy, building on the SCOU remedy, will achieve compliance any substantive requirements of these regulations that constitute ARARs for discharge into the retention pond on-site, including ch. NR 220, Wis. Adm. Code, WPDES Best Available Technology (BAT) requirements, at the point of discharge and ch. AIR 140, Wis. Adm. Code, PALs at a point directly below the discharge zone. To the extent it is subsequently

determined that it is not technically or economically feasible to achieve PALs, NR 140.28 provides substantive standards for granting exemptions from the requirement to achieve PALs. Such exemption levels may not be higher than the ESs.

40 CFR 131 - Ambient Water Quality Criteria. Establishes pollutant concentration limits to protect surface waters. These and other water pollution discharge limits are administered under the Wisconsin Pollutant Discharge Elimination System (WPDES) permit program. The selected remedy would satisfy both general and specific substantive requirements for discharge to on-site surface waters, namely the retention basin. Any waste to be discharged to a surface water must, if necessary, be treated to satisfy these standards prior to discharge. These treatment requirements are administered under N-R 200 and 220. The substantive requirements of these regulations will apply to collected groundwater to be discharged. The source control remedy is intended to eliminate contaminated surface runoff at the site. To the extent contaminated runoff is channeled directly to a surface water body, however, that runoff must comply with any applicable concentration limits.

3. Location Specific

Clean Water Act of 1977, as amended [33 U.S.C. § 1344] Executive Order 11990 and 40 CFR 6 - Protection of Wetlands. Wis. Admin. Code NR 103 - Water Quality Standards for Wetlands. These requirements provide for protection against loss or degradation of wetlands. Contamination in surface water runoff and groundwater will be controlled so that it does not have an adverse impact on nearby wetlands.

C. Cost Effectiveness

The selected remedy provides overall cost-effectiveness. Phased extraction that focuses on the most highly contaminated groundwater first adds a significant degree of permanence, as well as a further opportunity to assess the effectiveness of the SCOU remedy in reducing new contaminant loadings in groundwater. Thus, the effect of these remedial activities on compliance with ARARs and protection of human health and the environment will be analyzed before requiring a broader, more costly groundwater extraction and treatment system.

D. Utilization of Permanent Solutions and Alternative

Treatment Technologies to the Maximum Extent Practicable The selected alternative represents the best balance of alternatives with respect to the nine evaluation criteria described in Section VIII. The selected alternative adopts a phased approach to address groundwater contamination, extracting and treating contamination that exceeds regulatory standards.

E. Preference for Treatment As A Principal Element

By extracting and treating the contaminated groundwater, the selected remedy satisfies the statutory preference for remedies that employ treatment as a principal element to permanently and significantly reduce toxicity, mobility, or volume of hazardous substances.

XI. RESPONSIVENESS SUMMARY

This Responsiveness Summary has been prepared to meet the requirements of Sections 113(k) (2) (B) (iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, which requires U.S. EPA to respond "...to each of the written or oral presentations" on a Proposed Plan for remedial action. This Responsiveness Summary summarizes comments and concerns expressed by the public and other interested parties in written and oral form received by U.S. EPA on the recommended remedy.

On October 3, 1994, U.S. EPA made available to the public for review and comment the FS and Proposed Plan for groundwater at the Muskego Sanitary Landfill. This comment period was extended for 60 days until December 2, 1994.

U.S. EPA received comments at the public meeting on October 17, 1994, at the Muskego City Hall. Additional written comments were also submitted during the comment period.

Summary of Comments Received During the Public Comment Period

Comments received during the public comment period are summarized in this section. Some of the comments have been paraphrased in order to effectively summarize them in this document. The reader is referred to the public meeting transcript and copies of written comments submitted. All are available for review at the information repositories.

Comment: One commenter believes Alternative 2, Groundwater Monitoring, will provide protection to human health and the environment and therefore is a viable alternative.

The commenter stated that the previous removal actions and source-control measures, coupled with natural mitigating processes are expected to limit further groundwater contamination and result in a reduction of groundwater contaminant concentrations from those identified in the Remedial Investigation Report (RI).

The commenter views that in order to effectively evaluate the impact of the SCOU activities on groundwater there needs to be adequate time after completion of these activities to monitor groundwater contamination. In addition, nearby private residences have been connected to public water supplies and institutional controls that prohibit private well installation within 1200 feet of an existing landfill are in effect. The commenter believes that these conditions preclude the hypothetical exposure associated with the potential future use of the site and therefore Alternative 2 is a viable remedial option for this site.

U.S. EPA Response: U.S. EPA agrees that the previous removal and SCOU activities will have a positive effect on groundwater quality in the vicinity of this site. U.S. EPA believes these actions will contribute to the reduction of contaminant loading into the groundwater and coupled with natural mitigating processes will reduce contamination levels in groundwater. However, given the age and design characteristics of the source areas and the high level of contamination in the groundwater near the Non-Contiguous Fill Area, U.S. EPA does not believe that these actions will adequately address threats posed by the existing contamination in the groundwater nor completely eliminate additional contaminant loading into the groundwater.

The State prohibition on the installation of drinking water wells within 1,200 feet of the edge of waste may not always be effectively enforced, since it is dependent on the well driller or property owner contacting the WDNR prior to well installation. Also, the WDNR can grant variances from the prohibition, so the prohibition is not absolute, even if the WDNR is contacted. Therefore, the effectiveness of institutional controls relating to water supply well prohibition is dependant upon the site owner or contractor contacting the WDNR, and is not absolute, even if the WDNR is contacted.

U.S. EPA also agrees that one of the objectives of a phased approach to this remedy is to gather additional information on the effect of the previous remedial activities at the site. However, regardless of current risk or hypothetical future use scenarios of the landfill property, one of the objectives of this final remedial action is to determine how to effectively prevent or retard the migration of contamination already within the aquifer which will not be affected by SCOU actions. U.S. EPA believes that prior actions in combinations with natural processes may be effective in the outer limits of the plume beyond the source areas but, does not believe natural mitigating processes will be effective in areas of higher contamination near a source, such as the Non-Contiguous Fill Area. Therefore U.S. EPA disagrees with the comment that Alternative 2 is a fully protective alternative. For that reason, the remedy initially targets only the source area with the highest levels of contamination. This provides adequate time, as the commenter suggests, to evaluate the impact of clean-up activities on other areas of the site.

Comment: One commenter believes that Alternative 3, if selected, should be implemented in a phased approach to gain the necessary data to determine the progress towards, and probability of, actually achieving clean-up objectives. The commenter also believes that a comprehensive pilot scale test be included in the Alternative with the purpose of determining groundwater characteristics and evaluating discharge and treatment options. The commenter has indicated that an evaluation of the effectiveness of groundwater extraction in capturing contaminants and the potential for achieving groundwater clean-up objectives should be performed during the pilot test phase. Also a mechanism to re-evaluate the need for further groundwater extraction should be provided if necessary. Finally, the commenter believes that if results from the evaluation process indicate that only if the groundwater extraction will achieve these objectives and natural attenuation is ineffective in achieving the objectives should a long-term limited pump and treat system be installed and operated.

U.S. EPA Response: U.S. EPA agrees with the commenter that Alternative 3 should be implemented in a phased approach to accomplish the objectives associated with this ROD. U.S. EPA also believes that a pilot scale study should be completed as indicated in the description of Alternative 3. A Performance Evaluation Report will be required that evaluates groundwater characteristics, discharge and treatment options as well as other parameters. This study will, as the commenter suggests, be used to design an effective system. In addition, a mechanism to evaluate the progress toward achieving the groundwater clean-up objectives not only during the pilot scale test but during an extended duration will be required.

U.S. EPA does not agree with the suggestion that only if the groundwater extraction system is proven effective and natural attenuation is proven ineffective in the pilot test should a long-term limited pump and treat system be installed. Groundwater pump and treat systems are effective in removing and containing contamination. The pilot test is aimed at optimizing the design of a system, not to demonstrate the need for one. The ROD and the underlying documents demonstrate the need and show that the system will move the site toward achieving groundwater clean-up standards and addressing unacceptable levels of contamination more expeditiously.

Comment: One commenter who lives near the site would like their private well sampled for Volatile Organic Compounds.

U.S. EPA Response: Private wells near the site, including the commenter's well, were sampled in August 1991 by U.S. EPA. There was no contamination found during this sampling round in any of the wells. Groundwater monitoring since 1991 has not indicated a change in groundwater contamination levels, therefore there is no reason to believe that contamination would have reached this well rom the site. In addition, all residences in the vicinity of the site have been connected to public water thereby eliminating a concern for potential exposure through ingestion. U.S. EPA has provided this comment to the State authorities and recommends the commenter contact the local WDNR office for further information on procedures for private well sampling.

Comment: One commenter stated that all private and monitoring well results of all tests taken on her property be forwarded to her.

U.S. EPA Response: U.S. EPA will ensure that sampling results related to the commenter's property from the Interim Groundwater Monitoring Plan will be forwarded to the commenter as these results become available. Additional information regarding test results is available at the information repositories located at the Muskego City Hall and the Muskego Public Library.

Comment: One commenter from the City of Big Bend provided U.S. EPA with sampling information provided to him by the WDNR for his business. The commenter expressed concern for citizens that are not on public water and what is being done for them.

U.S. EPA Response: U.S. EPA thanks the commenter for this information. If more information is needed, the Agency will certainly contact him. The site currently does not impact any private drinking wells in the City of Big Bend. All private residences near the site have been connected to public water. A few residences retained their private well for non-potable uses such as watering their gardens and yard.

Comment: One commenter expressed concern that it was unclear how future public comment would be incorporated into the process of selecting and implementing additional remedial actions for Alternative 3.

U.S. EPA Response: U.S. EPA acknowledges the concern for public input on future decisions regarding this project. Contingency measures for Superfund projects are described in three categories. Non-significant changes, Significant changes and fundamental changes to the decision document are the means to make changes to a selected remedy. Non-significant changes are usually adjustments that relate to design, construction or administrative factors but do not significantly change or modify the remedy. These changes do not effect the overall scope of the remedy and are usually documented in the post-decision document file. This information can be placed within the information repository at the discretion of the project manager.

Significant changes are generally incremental changes described in a document called an Explanation of Significant Difference (ESD). These changes are communicated to the public through a public notice usually published in one or more of the local newspapers. In addition, changes under an ESD are placed in the information repository. The project manager has the discretion to seek public comment on the ESD.

Finally, any fundamental change to the remedy would require a ROD Amendment which requires the agency to open a 30 day public comment period. During this period the agency would notify the public through newspaper advertisements and solicit public review and comment on the Amendment. A public meeting would also be conducted by the agency during the comment period.